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CONTENTS

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PSYCHOLOGICAL REVIEW

containing original contributions only, appears bi-monthly, January, March, May, July, September, and November, the six numbers comprising a volume of about 540 pages.

PSYCHOLOGICAL BULLETIN

containing critical reviews of books and articles, psychological news and notes, university notices, and announcements, appears monthly (10 numbers), the annual volume comprising about 720 pages. Special issues of the BULLETIN consist of general reviews of recent work in some department of psychology.

JOURNAL OF EXPERIMENTAL PSYCHOLOGY

containing original contributions of an experimental character, appears bi-monthly, February, April, June, August, October, and December, the six numbers comprising a volume of about 600 pages.

PSYCHOLOGICAL INDEX

is a compendious bibliography of books, monographs, and articles upon psychological and cognate topics that have appeared during the year. The INDEX is issued annually in June, and may be subscribed for in connection with the periodicals above, or purchased separately.

PSYCHOLOGICAL ABSTRACTS

appears monthly, the twelve numbers and an index supplement making a volume of about 700 pages. The journal is devoted to the publication of non-critical abstracts of the world's literature in psychology and closely related subjects.

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consist of longer researches or treatises or collections of laboratory studies which it is important to publish promptly and as units. The price of single numbers varies according to their size. The MONOGRAPHS appear at irregular intervals and are gathered into volumes of about 500 pages.

JOURNAL OF ABNORMAL AND SOCIAL PSYCHOLOGY

appears quarterly, April, July, October, January, the four numbers comprising a volume of 448 pages. The journal contains original contributions in the field of abnormal and social psychology, reviews, notes and news.

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PSYCHOLOGICAL REVIEW COMPANY

PRINCETON, N. J.

Vol. 28, No. 9 November, 1931

THE

PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE THIRTY-NINTH ANNUAL MEETING OF THE AMERCIAN PSYCHOLOGICAL ASSOCIATION, INCORPORATED, TORONTO, ONTARIO, SEPTEMBER 10, 11, 12, 1931

REPORT OF THE RETIRING SECRETARY, CARL C. BRIGHAM, PRINCETON UNIVERSITY

The American Psychological Association, Inc., held its thirty-ninth Annual Meeting at the University of Toronto, Toronto, Ontario, on Thursday, Friday and Saturday, September 10, 11 and 12, 1931. Four hundred forty-eight persons registered, one hundred twenty-eight of these being members, one hundred sixty-five being associate members, twenty-nine newly-elected associates, one newly-elected member, and one hundred twenty-five persons not affiliated with the Association. An analysis of the registration by geographical districts and states is as follows: West North Central States, 55 (Iowa 18, Kansas 2, Minnesota 22, Missouri 11, Nebraska 2); East North Central States, 98 (Illinois 38, Indiana 2, Michigan 20, Ohio 35, Wisconsin 3); West South Central States, 5 (Arkansas 2, Texas 1, Oklahoma 1, Louisiana 1); East South Central States, 17 (Kentucky 7, Tennessee 7, Alabama 3); Mountain States, 2 (Colorado 1, Montana 1); Pacific States, 9 (California 9); South Atlantic States, 34 (District of Columbia 9, Georgia 2, Maryland 14, North Carolina 3, Virginia 2, Florida 4); Middle Atlantic States, 141 (New Jersey 13, New York 91, Pennsylvania 36, Delaware 1); New England States, 62 (Connecticut 28, Massachusetts 22, Rhode Island 5, Vermont 3, Maine 2, New Hampshire 2); Canada, 24; Norway, 1.

The program consisted of ten formal sessions in which forty-eight papers were presented by members and associates, seven ses-

sions made up of fifty-seven ten-minute reports, and six papers read at the meeting of the Section on Clinical Psychology.

On Friday afternoon the University of Toronto was host at a delightful tea held in the Quadrangle of Hart House.

On Friday evening, following a brief address of welcome by the Rev. Dr. H. J. Cody, the Presidential Address, "The Psychological Study of Behavior," was given by W. S. Hunter.

Apparatus was exhibited by a number of members and also by the C. H. Stoelting Company.

A meeting of the Council of Directors was called at 2:00 o'clock on Wednesday afternoon, September 9, and was adjourned at 9:35 o'clock that evening.

Transactions of the Annual Business Meeting

Due notice having been given, the annual business meeting of the American Psychological Association, Inc., was held on September 10, 1931, in the Physics Building of the University of Toronto, Toronto, Ontario, at 8:11 P.M., with President Hunter in the chair.

Upon motion duly made and seconded, it was voted that the minutes of the thirty-eighth annual meeting at the University of Iowa, be approved as printed.

The Secretary announced the results of the mail ballot which had been secured by the Council of Directors under instructions from the Association at its business meeting on December 29, 1930: that in alternate years, first consideration be given to invitations extended from institutions located in the territory west of the Appalachian Mountains.

	Members	Associates	Total
In favor of policy.....	248	407	655
Opposed to policy.....	83	78	161

The Secretary announced the results of a mail canvass of all members and associates to ascertain their preferences for a meeting in the second week in September or at the usual time in December:

	Members	Associates	Total
September.....	235	346	581
December.....	95	143	238

On motion duly made and seconded it was voted by over two-thirds (70/94) of the members present that Section I, Article II, of the By-Laws be amended by substituting "first two weeks of

September" for "last week in December"; that Section I, Article VI, of the By-Laws be amended by substituting "five" for "two," "one hundred and twenty" for "forty," and "ninety" for "seven" in the first sentence; and that Section 8, Article I, be amended by substituting "July 1st" for "March 15th."

On the recommendation of the Council of Directors, it was voted to accept the invitation of Cornell University for a meeting to be held at Ithaca, N. Y., on September 8, 9, and 10, 1932, and to appoint Professor Madison Bentley as a member of the Executive Committee for 1931–1932.

On the recommendation of the Council of Directors, it was voted that the Council of Directors be authorized to make arrangements for a meeting in Chicago in September, 1933, and to appoint a member of the Executive Committee for 1932–1933.

The Secretary announced the deaths of John R. Liggett, on February 10, 1931; Vivienne McClatchy, on January 12, 1931; Donald S. Snedden, on May 24, 1931; Albert Weiss, on April 3, 1931; Herman H. Young, on February 21, 1931.

The Secretary announced the resignations of the following members: M. J. Ream and P. F. Swindle. The Secretary announced the resignation of an associate member, Frank A. Pattie.

The Secretary announced the newly-elected officers of the Section of Clinical Psychology as follows: Chairman, Fred Kuhlmann; Secretary, Luton Ackerson; other members of the Executive Committee, T. G. Hegge for three years, M. R. Trabue for two years, and F. N. Maxfield for one year.

On recommendation of the Council of Directors, it was voted to elect the five persons named below as members of the Association:

List of Members

Transferred from Associate to Membership

1. Graydon LaV. Freeman
2. W. N. Kellogg
3. Dean A. Worcester

New Applications

1. Ludwig Kardos
2. Henry W. Nissen

On the recommendation of the Council of Directors, it was voted that the two hundred sixty-four persons whose names were pre-

sented by the Council for election as Associates be elected as Associates. Their names appear below:

1. Adolph William Aleck
2. Mark Knight Allen
3. Mary E. Ambler
4. Amos C. Anderson
5. J. Carver Anderson
6. Albert David Annis
7. Solomon E. Asch
8. Kenneth H. Baker
9. Egerton L. Ballachey
10. Margaret Evelyn Rowlands-Barnes
11. Estelle DeYoung Barr
12. William Alexander Barton, Jr.
13. Ross H. Beall
14. Henry Beaumont
15. Herman D. Behrens
16. Karl Schofield Bernhardt
17. Norma Bird
18. Mabelle Babcock Blake
19. Michael Seymour Blankfort
20. Weston Ashmore Bousfield
21. Kenneth Walter Braly
22. Frederick W. Brown
23. Junius Flagg Brown
24. Everett Griffin Brundage
25. Eleanor S. Brussell
26. Bryng Bryngelson
27. Jack Buel
28. Eugene Gower Bugg
29. Clara Burri
30. Anna Louise Butts
31. Dallas Eyre Buzby
32. Hadley Cantril
33. Harold S. Carlson
34. Hiding Bror Carlson
35. Mary C. Carpenter
36. Homer L. J. Carter
37. William Sturgeon Cassel-berry
38. Malcolm Campbell
39. Herbert Allen Carroll
40. Barry Casper
41. Robert Chester Challman
42. Walter Vernon Clarke
43. Dennis Hargrove Cooke
44. Herman Abner Copeland
45. Maurice Hugh Costello
46. William Harold Cowley
47. Sarah Eyre Crowell
48. Eleanor Davis Culin
49. Theodore Harold Cutler
50. Margery Gilbert Cutsforth
51. Thomas Darl Cutsforth
52. Norma Estelle Cutts
53. Frank Cornelius Davis
54. J. DeWitt Davis
55. Robert Alexander Davis
56. Leigh Carroll Douglass
57. Stanley Dulsky
58. Bertha Kathleen Duncan
59. Mervin Arnold Durea
60. Beatrice Jeanne Dvorak
61. J. Harlan Elder
62. J. C. Ellickson
63. Jack Maxwell Ferren
64. Vincent A. Fochtman
65. Charles Alfred Ford
66. Harold Ray Fossler
67. Arden Frandsen
68. Benjamin Frank
69. Ellis Freeman
70. Franklyn D. Fry
71. Lois Garrett
72. Louise Ward Gates
73. Jeanne G. Gilbert
74. Ralph Wesley Gilbert
75. Myrtle Mann Gillet
76. Molly Goldman
77. Nathan Goldman
78. Louis Deal Goodfellow
79. Helen Clara Goodman
80. Mary Agnes Gordon
81. Howard A. Gray
82. John Stanley Gray
83. William Griffith
84. Clarence H. Growdon
85. Ruth Burke Guilford
86. Harold Oliver Gullicksen
87. Elmer Robert Hagman
88. Calvin Springer Hall, Jr.
89. Clifton Wallace Hall

90. Marion J. R. Hall
91. Mary Woodhull Haller
92. Winslow Nicholas Hallett
93. Joseph V. Hanna
94. James Hargan
95. Philip Lawrence Harriman
96. Daniel H. Harris
97. Starke R. Hathaway
98. Melvin Saxton Hattwick
99. Edwin Ruthvan Henry
100. Lyle K. Henry
101. Amanda Herring
102. Pleasant Roscoe Hightower
103. Grace Marie Holmes
104. Charles Honzik
105. Louise Mary Horner
106. George Plant Horton
107. James Howard Huddleson
108. Joseph McVicker Hunt
109. Max Lewis Hutt
110. Inez Invaline Ireland
111. Hilda Joan Iseli
112. J. Elliott Janney
113. Marion Pauline Jenkins
114. Parrish Little Jette
115. Lonzo Jones
116. Edward L. Kemp
117. Carl Dan Killian
118. George Glenn Killinger
119. Franklin Hayward Knower
120. Laura B. M. Krieger
121. Maurice H. Krout
122. Josephine C. Kurtz
123. Edna Emma Lamson
124. Roy Clinton Langford
125. Alice M. Leahy
126. William Morton Lepley
127. Jessie M. Lightfoot
128. Oscar Frederick Litterer
129. Charles Frederick Lindsley
130. Donald B. Lindsley
131. Earl Granger Lockhart
132. Irving Lorge
133. Charlotte Lowe
134. Norman Wilson Lyon
135. Lydia E. MacKnight
136. Charles Judd Marsh
137. Helen Corbett Martin
138. Barbara Marx
139. Charles Wilkins Mason
140. Florence Roberts Mason
141. Eunice Matheson
142. Marion Louise Mattson
143. Elia Y. Melekian
144. James E. Mendenhall
145. Lorenz A. Meyer
146. Myrtle B. McGraw
147. Robert Bruce McKeown
148. Sister Mary Aquinas McLaughlin
149. Katherine Adele Miles
150. Joseph Miller
151. Ray E. Miller
152. Harry Harvey Milt
153. Lorenz Edwin Misbach
154. Elizabeth Fallin Moller
155. Winona Louise Morgan
156. Genevieve M. Murphy
157. Paul G. Murphy
158. Charles Roger Myers
159. Myron Arthur Myers
160. Waller Stephen Newell
161. James Curtis Newlin
162. Clarence LeRoy Nystrom
163. Zena C. O'Connor
164. Arthur T. Orner
165. Harriett O'Shea
166. Joy Lester Otis
167. Margaret Otis
168. Helen Pallister
169. James Ruey Patrick
170. John Gray Peatman
171. Francis Theodore Perkins
172. Doris Eugenia Perry
173. Joseph Pessin
174. Henry Nelson Peters
175. Marie Wilson Peters
176. Arthur Phillips
177. Zygmunt A. Piotrowski
178. Elizabeth Augusta Pleger
179. Martha Pollock
180. Priscilla Alice Pooler
181. Lillian G. Portenier
182. Edward F. Potthoff
183. Norman John Powell
184. Helene Powner
185. Bronson Price
186. Charles Bertram Pyle

187. Lloyd Ernest Rackley
188. Wilbert Scott Ray
189. Jeannette Regensburg
190. Charlotte Rice
191. Thomas W. Richards
192. Marion W. Richardson
193. John Christian Ringwald
194. Rowena Ripin
195. Katherine Elliott Roberts
196. Esther W. Robinson
197. Mary Francis Robinson
198. Kenneth Herbert Rogers
199. Wilda Mae Rosebrook
200. Isabel Rosenstein
201. Clay Campbell Ross
202. Joseph Rossman
203. Donald Allen Rothschild
204. Jean Brintnall Rowley
205. Anita Rubens
206. James Thomas Russell
207. Robert See Sackett
208. Milton A. Saffir
209. Ina Craig Sartorius
210. Byron Charles Sarvis
211. Tenjes Henry Schutte
212. Harold Gustav Seashore
213. Fred Ferdinand Senerchia, Jr.
214. Laurance Frederic Shaffer
215. Herman Jacob Paul Schubert
216. Richard Samuel Schultz
217. Edith Buick Scott
218. Robert Richardson Sears
219. Walter Cleveland Shipley
220. Donald Fox Showalter
221. Clement Henry Sievers
222. Ole Andrew Simley
223. Verner Martin Sims
224. Harold M. Skeels
225. Laila Skinner
226. Josephine M. Smith
227. Thomas Joseph Snee
228. Kenneth Wartenbe Spence
229. Ross Stagner
230. Kathryn B. Stahl
231. Allan Thurman Stanforth
232. William Harold Stavsky
233. Lula R. Stevens
234. Ralph Melvin Stogdill
235. Roy F. Street
236. Esther Marguerite Stubbs
237. St. Clair A. Switzer
238. Cornelia DeCamp Taylor
239. Harold Claire Taylor
240. Henry Royer Thompson
241. Carolyn Tiebout
242. Ruth Sherman Tolman
243. Brian E. Tomlinson
244. Rebecca R. Townsend
245. Dorothy Kinzer Tyson
246. Charles Cecil Upshall
247. Edward Bunn van Ormer
248. Wallace Theodore Wait
249. Robert Yule Walker
250. William Edward Walton
251. Hugh Lee Waskom
252. Walter Whittle Webb
253. Margaretta Weber
254. Ernest Lester Welborn
255. Austin L. Wells
256. Robert James Wherry
257. Ralph Kirby White
258. Ella L. Wieg
259. Douglas James Wilson
260. Paul A. Witty
261. John Bascom Wolfe
262. Sarah Wood
263. Henriette Kathryn Woolf
264. Caroline Beaumont Zachry

On the recommendation of the Council of Directors, it was voted to elect Donald G. Paterson of the University of Minnesota as Secretary for the term 1931–1934.

The report of the Committee on the Election of Officers was then presented, as follows:

President for 1931–1932: Walter R. Miles, Stanford University.

Directors for 1931–1934: Donald G. Paterson, University of Minnesota, and Calvin P. Stone, Stanford University.

Nominees for appointment to the Division of Anthropology and Psychology of the National Research Council: Edwin G. Boring, Harvard University, and K. S. Lashley, University of Chicago.

Representative on the Social Science Research Council: Carl C. Brigham, Princeton University.

On the recommendation of the Council of Directors, it was voted to substitute the name of Edward C. Tolman of the University of California for Professor Paterson as Director for the term 1931–1934.

On the recommendation of the Council of Directors, it was voted to substitute the name of Joseph Peterson of the George Peabody College for Teachers for Professor Boring, resigned.

On the unanimous recommendation of the Council of Directors, it was voted to elect Harvey A. Carr of the University of Chicago and Walter F. Dearborn of Harvard University as representatives of the Association on the Council of the American Association for the Advancement of Science.

On the unanimous recommendation of the Council of Directors, it was voted to ratify the appointment of Herbert S. Langfeld of Princeton University as editor of the *Psychological Monographs*.

The report of the Program Committee as printed on page 659 was read and approved.

On the recommendation of the Council of Directors, John E. Anderson of the University of Minnesota, Arthur G. Bills of the University of Chicago, and the Secretary were elected as the Program Committee for 1932.

The report of the representatives on the Social Science Research Council as printed on page 659 was read.

The report of the Committee on Precautions in Animal Experimentation as printed on page 660 was read and accepted with thanks.

On the recommendation of the Council of Directors, it was voted to elect E. G. Wever of Princeton University as a member of the Committee on Precautions in Animal Experimentation for the term 1931–1934.

On the recommendation of the Council of Directors, it was voted that reports of the financial status of the *Psychological Abstracts*, the Psychological Review Company, the *Journal of Abnormal and Social*

Psychology, and the American Psychological Association, Inc., as of December 31 of each year be audited, sent to the Council of Directors for approval and printed in the March number of the PSYCHOLOGICAL BULLETIN.

The Secretary announced the appointment by the Council of Directors of Leonard T. Troland, Clarence E. Ferree, and A. T. Poffenberger as representatives of the Association on the Inter-Society Color Council.

On the recommendation of the Council of Directors, it was voted to address the following communication to the Dewey Classification and Relative Index:

"The American Psychological Association, assembled at its annual business meeting in Toronto, September, 1931, desires to thank you for your considerate reception of the proposals of our representative, Chairman Madison Bentley, Division of Anthropology and Psychology, National Research Council. The Association believes that your recent revision of the rubrics for psychology has been of service to the psychological users of those libraries which follow your system of classification. The Association suggests that a further revision, especially in the fundamental divisions and relations of this part of your catalogue, might well be made. When you undertake this more fundamental revision, the Association will be pleased to aid you with suggestions and advice."

On the recommendation of the Council of Directors, it was voted to address the following communication to the Library of Congress:

"The American Psychological Association, assembled at its annual business meeting in Toronto, September, 1931, desires to thank you for your considerate reception of its representative, Chairman Madison Bentley, Division of Anthropology and Psychology, National Research Council, who has recently conferred with your Chief Classifier regarding the possibility of making certain fundamental changes in those classes of your catalogue which deal with the subject of psychology. The Association concurs in the belief of its representative that your present classification for psychology is antiquated and confused, and that it neither represents the present articulation of the subject nor the external relations of psychology to many related sciences and arts. The Association is further of the opinion that a thorough revision and resetting of psychological topics would be of very great service to the psychological users of those libraries which follow your mode of classification, and that such a reconstruction would much more intelligently represent to the general reading public the present status, methods, and accomplishments of psychology. Wherever and whenever this Association is able to assist you in plans for revision, you may freely call upon its officers and members."

The Secretary announced the appointment by the Council of Directors of J. McKeen Cattell as the Association's representative at the Seventh American Scientific Congress to be held in Mexico City in February, 1932.

The report of the Committee on Psychology of the National Advisory Council on Radio in Education as printed on page 662 was read.

On the recommendation of the Council of Directors, it was voted that the report be accepted with thanks and the committee continued.

The Treasurer presented the estimate of resources and the budget for 1932 as printed on page 663. On the recommendation of the Council of Directors, the budget was adopted.

Upon motion duly made and seconded, it was voted that the Association voice its appreciation to Professor Bott and the Department of Psychology, and to the administration of the University of Toronto, for their hospitable arrangements for the entertainment of the Association at this annual meeting.

On motion of Professor Fernberger, it was voted that the meeting express its appreciation to the retiring secretary for his efficient handling of the affairs of the Association.

The meeting adjourned at 9:13 P.M.

American Psychological Association, Incorporated

Report of the Treasurer for the Period from December 15, 1930, to August 20, 1931

Receipts

Balance, December 15, 1930		$9,962.09
Dues of Members and Associates	$4,384.00	
Sale of Monographs	12.57	
Sale of Yearbooks	2.00	
Sale of Programs	55.00	
Interest	194.47	
		4,648.04
		$14,610.13

Disbursements

Printing and Supplies	$532.20	
Postage and Express	143.26	
Telephone and Telegraph	7.81	
Reprints	86.00	
Yearbooks	564.87	
Proceedings (abstracts)	141.43	
Treasurer's Bond and Safety Deposit Box	31.00	
Committee on Animal Precaution	11.00	
Certification Reimbursement	35.00	
Secretary's Stipend	877.00	
Treasurer's Stipend	175.00	
Incidentals, 1931 Meeting	99.42	
Lawyer's Fee	15.00	
Subscriptions to Psychological Abstracts	1,683.00	
Exchange on Checks	.64	
		4,402.63
Balance on hand, August 20, 1931		10,207.50
		$14,610.13

Account of Ninth International Congress Deposited with American Psychological Association

On hand, December 15, 1930		$2,216.49
Interest		87.76
		$2,304.25

Report of the Program Committee, 1931

This year the Program Committee tried the experiment of arranging A and B sessions which would provide places for fifty papers judged by the committee to have the highest merit. The committee has been entirely impartial in making the selection but it must be admitted that the only evidence available for judgment is the abstract submitted and it is quite possible that poorly prepared abstracts may have been sent in for excellent pieces of work.

The innovation this year was a new type of session designated as Program C, each session including ten ten-minute reports listed by title only, no abstracts being printed. This program was designed to accommodate individuals desiring to make a preliminary report on a problem, to make a complete report on a minor problem, to report new apparatus techniques, new testing techniques, new statistical techniques, and the like. In the case of certain papers, which might seem to have warranted inclusion in the A and B sessions, the Program Committee felt that a brief, informal report would be better for verbal presentation than a longer formal report, and such papers were placed on Program C. All titles submitted by members and associates were included in Program C, and the committee included as far as possible reports from graduate students who were not members or associates. The merits of this new plan must be judged by the present meeting.

There were ninety-six papers submitted for Programs A and B and of these fifty were selected, thirty-eight were placed in Program C, and two were withdrawn because the author could not adapt his paper to the shorter program. There were thirty-two papers submitted for Program C, of which all were included except seven papers emanating from one laboratory.

Edward S. Robinson, *Chairman*
H. E. Garrett
Carl C. Brigham

Report of the Representatives of the American Psychological Association on the Social Science Research Council

After the full report given by Mr. Allport last December on the relations of the American Psychological Association to the Social Science Research Council, little can be added at this time. The most

important event since that report is the election of Mr. R. S. Woodworth as President of the Social Science Research Council, a well deserved distinction that honors not only the recipient but the profession he represents.

In accordance with the offer of the Social Science Research Council of aid to the constituent societies in the consideration of the promotion of research within the fields of the constituent societies, the American Psychological Association has appointed a committee to consider the relations of the A.P.A. to the S.S.R.C. in the field of research and to make plans for a conference or such other approach to the problem as it deems wise. The personnel of the committee is as follows: Floyd H. Allport, Carl C. Brigham, Knight Dunlap, Mark May, Henry T. Moore, Donald G. Paterson, R. S. Woodworth, R. M. Yerkes, and John E. Anderson, Chairman. The Committee will meet as a planning committee during the Toronto sessions.

FLOYD H. ALLPORT
JOHN E. ANDERSON
MARK A. MAY

REPORT TO THE AMERICAN PSYCHOLOGICAL ASSOCIATION OF THE COMMITTEE ON PRECAUTIONS IN ANIMAL EXPERIMENTATION

August 27, 1931.

To the Council of the American Psychological Association:

GENTLEMEN: During February, 1930, your Committee, at the instigation of Dr. Elliott C. Cutler, Professor of Surgery, Western Reserve University, and Chairman of the American Medical Association for the Protection of Medical Research, obtained from the Council of Directors an unanimous endorsement of the action of the American Association for the Advancement of Science protesting against the passage of H.R. Bill 7884, prohibiting the use of dogs for medical experimentation in the District of Columbia. This endorsement read as follows:

> "The Council of the American Psychological Association has expressed itself as in agreement with the resolution of the Council of the American Association for the Advancement of Science at their meeting on December 31, 1930, protesting against the passage of H.R. Bill 7884, prohibiting the use of dogs for medical experimentation in the District of Columbia.
>
> "The American Psychological Association is in accord with other scientific and medical bodies in its judgment that animal experimentation has been of inestimable value to mankind.

"It believes that the advancement not only of medical practice but also of education and social procedure is greatly indebted to animal experiments. Many of our most fundamental notions concerning learning which are now affecting educational procedure throughout the country have been drawn from observations of the most harmless character upon the behavior of animals in the experimental psychological laboratories of this and other countries.

"CARL C. BRIGHAM, Secretary,
"American Psychological Association."

This, together with a copy of the resolution adopted by the American Association for the Advancement of Science, was sent to all members of the House of Representatives. A large number of concurring replies were obtained from individual members of the House. And it is to be reported that the Bill did not pass. The resolution adopted by the American Association for the Advancement of Science at its meeting of December 31, 1931, was as follows:

"The American Association for the Advancement of Science, which has repeatedly recorded its protest against the enactment of legislation prohibiting animal experimentation for scientific and medical purposes, hereby protests against the passage of House Bill 7884 in the present Congress prohibiting the use of dogs for medical experiment in the District of Columbia.

"The circumstances under which this bill was favorably reported, as set forth in the minority report, make abundantly clear that this bill should be recommitted to the Committee on the District of Columbia for full and proper consideration by the members and for adequate presentation of objections by opponents of the Bill.

"This Association is in accord with the practically unanimous and often expressed authoritative voice of science and medicine that animal experimentation has conferred inestimable benefits upon mankind, as well as upon animals themselves, and is essential to the progress of the biological and medical sciences.

"The history of medical discovery affords countless examples of the necessity for the use of dogs in certain kinds of experiment, as may be illustrated by the experiments leading to the recent discoveries of insulin in the treatment of diabetes and of liver extract in the treatment of pernicious anemia.

"The conditions under which animal experimentation is conducted in the government and medical laboratories in the District of Columbia afford every safeguard against the infliction of unnecessary suffering upon the animals.

"No legislation of the character proposed in this bill has ever been enacted in spite of the efforts of antivivisectionists in this country and abroad for many years.

"This association with a membership of over nineteen thousand and representative of all the sciences of nature and of man is confident that if the members of Congress become fully informed of the injury which would be inflicted upon the progress of curative and preventive medicine by such legislation H.R. Bill 7884 will not receive their favorable consideration."

Your Committee would also recall to you that it has on hand a supply of cards on which are printed the Code of Rules Regarding Animal Experimentation adopted by the American Psychological Association in accord with the American Medical Association. Your Committee stands ready at all times to supply these cards to laboratories experimenting with animals and it has adopted the policy of sending out fresh copies of the cards on alternate years to all such laboratories.

Finally, may your Committee again request that psychologists report to the Committee all matters which might endanger experimental work with animals, such as impending legislation in one's locality, cruel or inhumane treatment of laboratory animals, criticisms by humane societies, or published material which violates the code of rules adopted by the American Psychological Association.

Respectfully submitted,

W. T. HERON
C. J. WARDEN
E. C. TOLMAN, *Chairman*

September 4, 1931

To the Officers and Council of the American Psychological Association:

The Committee appointed at the request of the National Advisory Council on Radio in Education to advise regarding the broadcasting of psychology makes at this time a brief report of progress, supplementing the Interim Report which was sent August 7, to all officers and members of the Association. That report summarized the findings of an inquiry as to the extent and character of recent broadcasting on psychological themes, and defined the lines of activity undertaken by the Committee in an effort to bring to the attention of a wider audience such opportunities as there are to hear authentic psychologists and in other ways to increase the effectiveness of educational broadcasting on subjects related to our science.

Since the Interim Report was prepared we have secured additional information regarding British experience particularly with

reference to the preparation of short unit courses of six to twelve lectures each, and the organization of groups of listeners who meet to hear the talk and then to discuss the questions which it raises. Sub-committees are advising with reference to the possibilities in special fields such as Child Development, Animal Behavior, Abnormal Psychology and Industrial Psychology.

To differentiate the "authentic psychologist" from the self-styled psychologists and other broadcasters whose professional status may be in question, we are now using this definition: "A psychologist is a person whose training and professional qualifications meet the standards established for membership in the American Psychological Association."

It now appears probable that we shall have an opportunity to try an experiment in broadcasting in the near future. Eventually we hope to find the answers to several questions now puzzling us, as to the most effective ways of using the radio for adult education. Meanwhile we ask for whatever suggestions or instructions the Association or its officers may make for our guidance. We do not ask for funds, since the Committee's expenses for printing, clerical aid, conferences, etc., are being met by the National Advisory Council on Radio in Education.

Respectfully submitted,
W. V. BINGHAM, *Chairman*

AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.

Budget for 1932

Printing and Supplies	$600.00
Postage and Express	500.00
Reprints	800.00
Year Book	800.00
Proceedings (Abstracts)	500.00
Incidentals 1932 Meeting	100.00
Apparatus Exhibit	50.00
Treasurer's Bond and Safety Deposit Box	50.00
Committee on Animal Experimentation	25.00
Subscriptions to *Psychological Abstracts*	4,500.00
Secretary's Stipend	1,500.00
Treasurer's Stipend	300.00
Total	$9,725.00

ABSTRACTS OF PAPERS

PROGRAM A

THURSDAY, SEPTEMBER 10, 9:30 A.M.
EAST HALL, SECOND FLOOR
MARGARET F. WASHBURN, *Chairman*

Is Development Saltatory as Well as Continuous? MARY SHIRLEY, University of Minnesota.

Reasoning by analogy from physical growth and by observation of the steady upward rise of learning curves and the increase in mental scores of children tested at widely spaced intervals psychologists have pretty generally accepted as a fundamental law of development the principle of *continuity* so ably expressed by Hollingworth in the statement "Development is continuous rather than saltatory and spasmodic." The question Is development both saltatory and continuous? ceases to be a paradox if we differentiate clearly between two phases of development, ability to do and skill in the doing; between emergence of new behavior items and subsequent improvement in them. May it not be that in looking upon development as continuous we have focused our attention on its improvement phase to the neglect of its emergent phase? Even though the child improves in width of broad jump inch by inch, may he not show a sharp transition from not jumping at all to jumping the first inch? Babyhood and adolescence, periods at which growth is proceeding at its most rapid rate, are the best ages for studying both the continuous and saltatory phases of development. Furthermore repeated observations on the same subjects over a considerable period is a better method for such study than that of sampling behavior at different age levels. Surveys of the baby's abilities at six, twelve, and eighteen months tell us how far up the developmental ladder he mounted in each interval; but they will never tell us whether he achieved his rise by climbing perceptible steps or by executing an upward glide. A two-year study of more than twenty Minneapolis babies wherein examinations were so closely spaced as to make observation virtually continuous, and wherein the examiners' data were supplemented by daily records kept by mothers, offers considerable evidence that many new behavior items emerge full-fledged and all in a piece rather than

bit by bit. Not only does emergence of new items proceed by fits and starts, but also cumulative developmental scores for individual babies hitch and halt in their upward course. Behavior dependent on maturation would emerge in this saltatory fashion.

A Comparison of Analogic Change in Children and Adults. DAEL L. WOLFLE, Ohio State University.

A group of children and a group of adults were each taught an artificial linguistic system consisting of the nonsense names of nonsense figures. The figures, the names of which comprised the language, were classifiable into four size and four form categories. The names of the individual figures consisted of two syllables of which the first syllable denoted the size and the second denoted the form of the figure. Into this systematic pattern six variants were introduced. In two of the names the syllable order was reversed. In four other names one speech sound was altered. This served to produce an approximate analogue of such a language as English. Both the figures and the names were selected on the basis of meaninglessness by a large group of judges. This was done in order to avoid the interference of previously acquired linguistic habits and associations. Records were kept of every response made to each of the figures both during the period of learning and after learning was satisfactorily complete. This provided data both on learning of language and on tendencies toward analogic change within the language. The data on learning support both Hull's work on the learning of generalized abstractions, and Thurstone's (1930) work on the nature of the learning process. The most frequently occurring type of analogic change was that which would reduce the language to a more systematic basis. Thus those names which had previously been altered by the experimenter were changed by the subjects in such a way as to make them more perfectly conform to the pattern set by the remainder of the language. Another tendency, which produced a similar result, was also noticed; in that the previously altered names tended to produce changes in the remainder of the system which made it conform to a new pattern set by one or more of the variant names. Either of these types of change would result in greater regularity of linguistic structure. A similar tendency has also been noted in the action of analogic change within true languages. The more detailed results of the two experimental groups will be compared: (1) with respect to learning; and (2) with respect to frequency and type of analogic changes.

A Genetic Study of Grasp. H. M. HALVERSON, Yale University.

The results of a four-year investigation of prehension of objects of different forms, *i.e.*, balls, cubes, cups, hand bells, pellets, rods, and spoons, reveal significant developmental sequences of patterns of grasp which are consistent with chronological age. The principal conclusions are: (1) The index to development of prehension is the position within the hand toward which the digital forces that function in the act of grasping concentrate. If, then, we plot on the hand the six points which successively represent the focus of these individual forces in each of the progressive stages in the development of grasp, the line joining these points has its origin in the upper portion of the palm midway of the thenar and hypothenar eminences. The line extends first to midpalm, then to the lower end of the median of the thenar eminence and finally out to a point on the tip of the thumb. (2) The type of grasp which an infant uses depends in part upon the length of the digits, in part on the maturation of the neuromusculature of the hand, in part on the development of tactual perception by the digits and finally on the infant's ability to coördinate both coarse and fine arm and hand adjustments in reaching with visual perception of the object which is to be prehended. (3) Thumb opposition in grasping begins to function as the grasping reflex disappears. At this time also the sharp flexion at the phalangeal joints of the hand and the intense grip which is all out of proportion to the force actually required to hold the object gradually diminish, so that by the time the finger-tips replace the palm in grasping, the infant adjusts the force of the grip to the mass of the object. (4) Investigations on the extent of myelination in the brain and peripheral nerves at birth and at later dates, on motor phenomena and cutaneous sensibility following lesions in various parts of the cortex and severance of peripheral nerves and on the increase in excitability of muscles and peripheral nerves during the first weeks of life appear to confirm our findings that for the greater part of the first few months of life the human infant is largely a "thalamo-pallidal being." (5) At sixty weeks infants rank with adults in refinement of grasp.

A Study of Senescence. KEITH SWARD, Western Reserve University.

The Problem: This investigation was part of the Stanford program for the study of later maturity. *Method:* (1) Mental tests were given to a highly selected group of faculty members at two leading universities on the Pacific Coast; (2) the groups included 45 professors, aged sixty to eighty years, and 45 younger men, aged twenty-

five to thirty-five; (3) comparability was roughly controlled for social status of ancestry, college scholarship, and academic field; (4) individual testing was conducted with a three- to four-hour mental test for superior adults; (5) behavior notes included a verbatim copy of speech responses volunteered by each subject. *Results:* (1) Regardless of age classification, men listed in *Who's Who* and members of Phi Beta Kappa made consistently higher scores than those not so distinguished; (2) the tests did not differentiate between holders of the Ph.D. and those who lacked the degree; (3) retardation or slowing down is the chief characteristic of the elderly group; little overlapping occurs on the speed tests; (4) accuracy or correctness of response on power tests is affected adversely by age but less so than speed; (5) the old excel only in vocabulary (*Synonyms and Antonyms,* one of eight sub-tests); (6) age losses are very slight on tests closely allied to one's field of specialty, *e.g.,* in numerical tests given to elderly physical scientists; (7) a significant age difference is found in the number of self-disparaging words used by old and young during the test experience; the old indulged in decidedly more self-belittlement; (8) age differences throughout are slight in comparison with individual differences among either old or young.

Perceptual Abilities in the Age Range from Seven to Ninety-Two. W. R. MILES, Stanford University. (This study was made in collaboration with Mr. Bronson Price, at the Department of Psychology, Stanford.)

A group of 720 subjects, 294 males and 426 females, were examined by means of a battery of six varieties of perception test materials, all of which were presented by means of the Weaver Tachistoscope. In this technique the subject exposed the horizontal line of items by simple pressure on a key. A coefficient of .91 represents the reliability of the test instrument. The entire examination required only thirty minutes, and constituted one-fourth of the total examination program in this part of the Later Maturity Project. Approximately the same number of subjects were secured for each year-age. The plotted means and s.ds. are self explanatory. There is a rapid rise from seven to seventeen years, and beyond this at first a gentle descent while beyond sixty-two the descent is quite rapid. Age forty was comparable to age fifteen; age fifty to fourteen; sixty to twelve; seventy to nine; and eighty to the score made by six-year-old sub-

jects. The mean score for men was about 4 per cent higher than that for women. The regression of perceptual ability on age shows men .67 p.e. 0.22; women .64 p.e. .019. The "etas" are also presented in the charts. The ability of the men appears to deteriorate more rapidly than that of the women, but the groups showing higher mental ability have a slower rate of decline.

PROGRAM B

THURSDAY, SEPTEMBER 10, 10:00 A.M.
WEST HALL, SECOND FLOOR
WALTER S. HUNTER, *Chairman*

An Experimental Study of the Principle of Equivalence of Stimuli in Human Learning. ROBERT LEEPER, University of Arkansas.

One of the basic questions as to the nature of learning is this: Is learning dependent upon the establishment of certain definite restricted neural pathways, or is learning dependent upon the organization or pattern of stimulation and of nervous activity? The studies to date of the principle of equivalence of stimuli (especially by Lashley, Klüver, and Pavlov) have tested for equivalence at the conclusion of training. The present study used a fundamentally different approach. Certain habits were established by courses of training in which a different stimulating situation was presented in each trial, the difference between the situations being a matter of the absolute qualities of the situation and not of the pattern of stimulation. The rapidity of learning under such training was compared with the rapidity of learning by control groups presented with the same situation in every trial. Experiments were conducted with three different types of material, and with a total of 312 subjects. With a difficult pencil maze, the learning curves are virtually identical for the control group and the "varied" group (with which the scale of mazes used ranged from .67 to 1.33 of that of the "constant" group). In a second experiment on the learning of associations to simple melodies, it was found that varying the key in which the melodies were presented resulted in a total score only .83 $S.E._{diff.}$ less than one $S.E._{diff.}$ lower than the total score secured when the melodies were presented in the same key in all trials. In a third experiment, however, contrasting results were found. Using an

intricate number maze in which subjects were required to locate and connect consecutive numbers on a sheet (the varied condition in this experiment being secured by changing, by certain amounts, all of the numbers on the sheet, but holding constant the pattern to be traced), the "varied" group quadrupled its score in the 15 trials of one minute each, but the "constant" group gained so much more rapidly that the final mean scores differed by 5.6 $S.E._{diff.}$ An analysis of the results of these experiments indicates that equivalence of stimuli may spring from two sources—unlearned sensory equivalence, and equivalence derived from training—and that equivalence of stimuli, at least as dependent upon sensory equivalence, is probably inherent in the learning process.

An Analysis of the Curves of Learning and Forgetting Code Material. HOWARD EASLEY, Duke University.

Twenty-four college students practiced ten minutes per day, three days per week, for twenty practice periods, writing a single sentence in code. Each of the ten-minute periods was divided into ten one-minute periods. The curve of progress for the whole group with ten minutes as the unit of practice rose rapidly from the first, with only slight negative acceleration toward the end. Analysis of the results showed that with one minute as the unit of practice the curve was positively accelerated at the beginning. In order to eliminate so far as possible the effect of varying amounts of previous informal practice, points were taken as equivalent which were one-third of the maximum score for a ten-minute practice period for each subject (after Thurstone's equation). When the averages for the whole group were computed for the various practice periods thus equated, the curve of progress was definitely ogive. Some of the curves of the individual subjects were positively accelerated, some negatively accelerated, and some were ogive. This accounts for the approximately straight-line shape of the composite curve as originally plotted. For measuring forgetting, the twenty-four subjects were divided into four groups. These groups were equivalent at the end of the learning exercise. They were tested with a five-minute test five, ten, seventeen, and thirty-one days respectively after the end of the practice. The curve of forgetting thus obtained, instead of dropping rapidly at first, dropped very slowly at first, in fact not perceptibly for the first ten days, and then more rapidly to a loss of 39 per cent at the end of thirty-one days. If the first three measure-

ments of retention had been omitted in this experiment the curve would resemble the typical curve of forgetting. The rate of forgetting was so great from seventeen to thirty-one days that it would seem to be rapid for the first thirty-one days after practice.

Forgetting and the Law of Disuse. JOHN A. MCGEOCH, University of Missouri.

Relatively little attention has been given to a theoretical explanation of the phenomena of forgetting. A few attempts have been made at a systematic theory of retention, but retention and forgetting are not completely obverse functions, and each demands a separate treatment. The distinction between the two will be elaborated, but the discussion has primarily to do with forgetting. Where any effort has been made to formulate a general explanation of forgetting, the law of disuse has usually been invoked. It is the purpose of this paper to state and to present evidence for the following points: (1) Forgetting is a phenomenon which pervades learning itself and, as well, a majority of the systematic categories of psychology. It is, therefore, of major theoretical importance. (2) While the law of disuse is, within limits, roughly true, it is too general, even within these limits, to be important. Disuse is significant only in that it gives other factors a chance to operate. (3) These other and more specific factors, which are the primary conditions of forgetting, are retroactive inhibition and altered stimulating condition. Each has been studied experimentally, but seldom has either been assigned the place which it merits as a primary explanatory condition. It is the implication of the facts to be reviewed in the paper that forgetting is a function of the kinds and conditions of interpolated experience and of the nature and degree of the shift in stimulation, not of the period of disuse as such. (4) Other factors, such as the method of learning, the age of the subject, the character of the material, and disuse itself, may set limits to the operation of these primary factors, but are themselves secondary in importance. (5) From the standpoint of an adequate explanation of forgetting, research upon certain crucial problems in the operation of the primary factors is necessary.

An Experimental Study of the Law of Effect. R. H. WATERS, University of Arkansas.

A type of experiment emphasized by Thorndike at the present time has led him to this conclusion: The consequences of an act, in the form of "right" and "wrong" comments by the experimenter, pro-

duce learning; repetition without such comment does not do so. The present paper grew out of an attempt to verify and extend Thorndike's study. In so far as Thorndike has specified his procedure, our experiments have exactly duplicated that reported by Thorndike in 1927 on judging lengths of cardboard strips. The "repetition" group made their estimates with no information by the experimenter of the correctness or incorrectness of their judgments; the "right comment" group were told whether their judgments were correct or incorrect by the simple statement "right" or "wrong"; with the "wrong comment" group the experimenter said "right" when the judgment was incorrect and "wrong" when it was correct; the "distributed comment" group were rightly informed on half of their judgments and wrongly informed on the other half (the correct and incorrect information, respectively, being distributed in chance order). These latter two groups represent conditions not employed by Thorndike. The results of the first experiment differed from those of Thorndike in that the "repetition" group made nearly as great improvement as did the "right comment" group. This distinct difference occasioned the second experiment as a repetition and check on the first. The second experiment, however, verified the findings of the first. In each experiment the "distributed comment" group also increased in accuracy, but somewhat less than did the "repetition" group, and the accuracy of the "wrong comment" group decreased. An analysis of the data obtained in this and Thorndike's experiments indicates a number of problems relative to the conditions which determine the influence of the effect or consequence of an act on learning—especially that an adequate understanding of the Law of Effect requires a determination of the types of consequences which produce learning and the conditions which influence their operation. The bearing of this analysis on the other laws of learning is pointed out.

PROGRAM OF

SECTION OF CLINICAL PSYCHOLOGY

THURSDAY, SEPTEMBER 10, 9:30 A.M.

ROOM 8, GROUND FLOOR

J. B. MINER, *Chairman*

ANNUAL BUSINESS MEETING OF THE SECTION

Certification of Psychometrists. F. KUHLMANN, Department of Public Institutions, Minnesota.

On Evaluating the Relative Importance or "Seriousness" of Various Behavior Problems in Children. LUTON ACKERSON, Illinois Institute for Juvenile Research.

Some New Bases for Interpretation of the I.Q. BETH L. WELLMAN, State University of Iowa.

The Impulsions of Adolescents as Revealed by Their Wishes. JOHN N. WASHBURNE, Syracuse University.

The Work of the New York Association of Consulting Psychologists. EMILY BURR, Vocational Adjustment Bureau, New York City.

Report on the Results of Psychological Work in Salvaging Old Age. LILLIEN J. MARTIN, San Francisco, Calif.

PROGRAM A

THURSDAY, SEPTEMBER 10, 2:00 P.M.

EAST HALL, SECOND FLOOR

KNIGHT DUNLAP, *Chairman*

A Comparison of Primates in Delayed Reaction Tests. HARRY F. HARLOW, University of Wisconsin.

The capacity of a group of primates to make appropriate responses following periods of delay was tested in this investigation. These animals, which were maintained at the Vilas Park Zoo, included an orang-outan, a gibbon, four macaccus rhesus, two Java monkeys, a

mona monkey, two ringed-tail monkeys, a sooty mangaby, two green monkeys, three mandrils, three baboons, and a lemur. Two different forms of apparatus were used. The first type did not shield the experimenter from the sight of the animals and left the two small metal containers, under one of which food was placed, exposed during the period of delay. As the experimenter was outside the cage during the tests, the food was placed on the first type of apparatus beyond the reach of the animal and the apparatus was moved up to the bars at the expiration of the delay period. The second type of apparatus concealed the experimenter and made it possible to hide the containers from the direct vision of the animal during the delay period. The tests on the lemur were almost completely negative, for although he learned to push over a cup and obtain food, he could not learn to react selectively to even momentary periods of delay when more than one container was introduced. The maximum periods of delay to which the monkeys were able to respond in these tests ranged from about thirty seconds to three minutes. Marked individual differences were found in the various monkeys both in speed of learning and maximum period of retention, but consistent characteristic differences in the genera were not obtained; the baboons, for example, proved to be as capable performers as the macaques. All of the monkeys, however, gave evidence of being able to respond on the basis of central cues, independently of bodily posture. This fact was determined by observation of the animal's head and body posture during the delay period, by intentionally presenting the wrong container to the monkeys, and by completely redirecting the attention and posture of the animals during the period of delay. The gibbon did not respond successfully to delays over thirty seconds in length; and his best performances by this criterion were therefore definitely inferior to those made by the best of the monkeys. Incomplete tests on the orang-outan indicated that his capacities in these tests were well beyond those of any of his companions, as he responded successfully to ten-minute delays, the longest that were attempted. A number of more difficult problems involving transposition of the containers, and discriminations between number of pieces and amount of food, were also solved by part of the animals.

The Delayed Response. M. O. WILSON, University of Oklahoma.

This paper represents part of a larger program to determine the nature of the sensory cue and the symbolic processes in the delayed response. The problem box was an H-shaped maze in which the

sides (30 inches long) may be designated as the stimulus compartment (SC) and response compartment (RC) and the bar (24 inches long) as the delay compartment (DC). On entering SC the animal was forced to turn either to the right or left. In either case it then followed DC to RC, where it had the "choice" of turning right or left. At either end of RC was a foodbox but the door to only one of these was unlocked in any trial, depending upon the direction of turn in SC. One group of nineteen rats (homolateral group) were trained to turn in the *same* direction in RC as in SC. All except one rat scored 70 per cent and most of them scored 80 to 90 per cent correct choices in forty successive trials. This level was reached within 100 to 580 trials. Another group of four rats (heterolateral group) were put through the maze under the same conditions except that they were required to turn in RC in a direction *opposite* to that in SC. Only half of them mastered this problem and the number of trials required was considerably higher. The time required to traverse DC was approximately one second. Additional delays of one to twenty seconds were introduced for both groups after mastery. All rats responded accurately after an additional delay of one second (total two seconds). However, only one exceeded this delay, the total being six seconds. Rats which were most rapid and smooth in their running (*i.e.*, those with less tendency to stop or make other disorienting responses) made higher scores and reached mastery earlier. The percentage of correct runs near the point of mastery in which there were no spontaneous pauses at crucial points was more than twice that for trials with such pauses. It is concluded tentatively that the rat can delay a response to the system of cues involved in this problem not more than six seconds and that duration of the delay is a function of a motor set which prevails during this delay. Further data are being obtained as to the nature of the cues and other factors involved in the delayed response.

The Inheritance of Spontaneous Activity in the Rat. E. A. RUNDQUIST, University of Minnesota.

Work in the field of activity has been difficult because of the enormous individual differences and the apparent fluctuating nature of the trait. To determine the extent these individual differences were inherent, whether two strains could be isolated, one relatively non-active, one relatively active, was the combined purpose of the experiment. The thesis is put forth that these differences are largely inherent. The attempt to isolate the two strains has proved largely

successful after ten generations of selection. This selection has not been completely orthodox for practical reasons. The apparatus used was the revolving drum of the squirrel-cage type first used by Stewart in 1898. Sufficient reliability was obtained to warrant use of this apparatus for group selection. The P rats consisted of forty-eight rats from the colony at the University of Minnesota. The F9 distributions of activity show little overlapping. Curtailment of distributions at both ends does not allow the usual statistical methods to present the situation adequately. The D/σ difference between the fast and slow males of the F1, F2, F3, F4, F5, F6, F7, F8, and F9 generations were respectively 2.37, 2.03, 4.40, 0.35, 5.22, 8.82, 7.86, 9.07, and 11.00. For the females of the corresponding generations they were 0.48, 3.37, 2.32, 0.31, 2.23, 11.05, 7.70, 10.50, and 12.66. It may be seen that selection first manifests itself with any degree of positiveness in the F5 generation. There are several explanations of this. . Second litters of the F6 yield a D/σ difference of 9.93 for males, and one of 6.8 for females. Due to the sex difference and the fact that it is intimately related to the oestrual cycle, it is difficult to equate male and female scores under the present experimental conditions. Hence, parent offspring correlations are ambiguous. There appears to be no tendency for one of the parents to be more closely related to activity of offspring than the other. Further experiments are being started with the separate strains in the attack of various problems. Crossing the strains to get a clearer idea of the genetic nature of the trait is also being undertaken. We have evidence that increase in the quantity of food consumed, at least above a certain minimum, has practically no effect on relative activity. There is some effect on absolute activity. Weight is not an important factor as shown by the fact that the weight distributions change little throughout the course of the experiment. An experiment conducted with Dr. J. G. Rockwell, who performed a thyroparathyroidectomy on a selected group of animals, furnishes some evidence that these glands are a factor in regulating this activity.

The Results of Ten Experiments on Some Variables which influence Motility in Children's Sleep. SAMUEL RENSHAW, Ohio State University.

During the past two years we have secured 6,290 child nights of sleep on 170 different children, aged six to eighteen. The apparatus, which records electrically the stirs of the sleeper, has been operated for a total of 329 nights. Twenty beds are used simultaneously and

an analysis of the motility record is made minute by minute. While the influence of recuperative sleep on health and behavior is known, yet there is very little factual information in the literature as to how children sleep, how they differ from adults, how to determine the normal sleep pattern of a child, what the factors are which influence motility during sleep, age, sex, and seasonal differences and the influence of such variables as viewing various types of motion picture films before retiring, an experimental reduction of the sleep ration and the influence of drinking coffee with the evening meal. Motility is very little influenced by temperature and humidity although there are significant seasonal differences. Statistically reliable differences are shown in the differential reactions of the sexes to seasons, motion pictures, coffee, and sleep deprivation. Younger children show less activity and longer quiet periods than do older ones within the age limits of our experiment. Using the change in motility incidental to normal growth and development as a base, it is proposed to show by the method of equivalent measures that magnitude of any given influence can be expressed in terms of fractional yearly growth increments. Because of the difficulty of describing "normal sleep" bearing of our findings on current theories of the sleep will be considered briefly.

A Graphic Study of Movement Systems. COLEMAN R. GRIFFITH, University of Illinois.

This is a study of phasic rather than of static movement systems (Washburn). Phasic systems were photographed with the aid of a constant speed moving picture camera set at right angles to the plane of action. Semi-nude bodies were marked in such a way that reference points on the head, the shoulder, the hip, the knee and the ankle could be transferred from the moving picture film to coördinate paper. The angles formed by the following pairs of lines, viz., the toe-ankle—ankle-knee, the ankle-knee—ankle-hip, the knee-hip—hip-shoulder, and the hip-shoulder—shoulder-head lines were measured in each frame of the film throughout a complete movement system. Each set of angle-values from each of the line relationships thus described were then plotted against time. The resulting curves gave a graphic representation of the different parts of phases of a complete movement system. In other words, it was possible to draw a precise geometrical representation of a fluent behavior pattern. Movement systems of three types were studied, viz., those created by highly skilled performers, those created by awkward performers and those

created by persons under the influence of fear. Pictures were taken of these three types of performance in each of the following skills, viz., high diving, casting, and backward hand-springing. There were 17 subjects, 10 complete movement systems for each subject, making in all some 3,400 measurements. A study of the curves gained by this method shows (1) the tendency of certain movement systems to resemble a section of a low speed airplane wing and of others to resemble a section of a high speed wing; (2) the relation between the form or pattern of a movement and the pace or timing of the system; and (3) the typical features of a highly skilled movement carried out under the emotion of fear. Both awkward and fearful movements differ from a highly skilled movement primarily in timing or pace. Awkward movements differ from fearful movements through a definite but arhythmic variation in pace.

PROGRAM B

THURSDAY, SEPTEMBER 10, 2:30 P.M.
WEST HALL, SECOND FLOOR
R. S. WOODWORTH, *Chairman*

The Functions of the Semi-Circular Canals: The Immediate and Remote Effects of the Extirpation of the Canals in the Pigeon. FRANKLIN FEARING, Northwestern University.

A technique has been developed for the experimental removal of specific portions of the semi-circular canals for the purpose of observing the immediate and remote effects of such operation on the equilibratory and postural behavior of the bird. The results from this type of experimentation as reported in the literature are conflicting. The present experiment is confined to the study of the effect on the behavior of the bird of removing (1) a section of the right lateral canal without disturbing the nerve endings in the ampulla, and (2) the ampulla of the right lateral canal. Before the operation the birds are trained in a simple maze in which are placed obstacles of various types. These obstacles require the bird to hop, perch, walk up an inclined plane, etc., and their purpose is to afford a series of situations in which the bird may be periodically tested for specific equilibratory disturbances. Approximately thirty birds have been trained and operated on. The following tentative generalizations seem warranted: (a) Removal of from two to four centimeters of one canal

(right lateral) is not followed by serious disturbances of equilibrium, although any "flow" of fluid (as is assumed by certain theories of vestibular function) through this part of the canal is impossible. (b) Removal of the single ampulla is followed by certain characteristic disturbances of the equilibratory function in the case of certain birds. In the case of others the behavior symptoms are of quite a different character. (c) Contrary to the classical and contemporary reports of the results of this type of investigation, there is enormous variability both as to type and severity of the symptoms following surgical interference with the canals, but there appears to be but little constancy as to the time of appearance of the symptoms and the rate of recovery of the bird. (d) There is some evidence for the complete restoration of function even in the case of birds which have shown the most severe type of symptoms. (e) The various types of symptoms do not appear at the same time, but tend to follow a definite time order.

The Significance of the Galvanic Recovery Curve. CHESTER W. DARROW, Institute for Juvenile Research, Chicago.

By means of micro-moving pictures of the sweat glands and of the shadow of a galvanometer pointer, the appearance and disappearance of sweat in an area surrounded by an electrode is demonstrated to accompany the rise and fall of the galvanic curve. The disappearance of the sweat is often so sudden and striking as to suggest an active resorption process. The rate of recovery of resistance following the peak of reaction (the per cent recovered in three seconds) appears, in part at least, to be a function of this resorption(?), of the subject's good health, and of certain other significant variables, *e.g.*, (1) the magnitude of the preceding reaction, (2) the resistance level at which reaction occurs, and (3) the psychological state of the subject. In so far as we may judge from efforts to change one variable at a time, these relationships may be stated briefly: (1) the larger the galvanic reaction, the steeper the curve of recovery; (2) the higher the subject's resistance, the less steep his recovery; and (3) the greater the subject's anxiety or mental tension, the less steep his recovery curve. By plotting the subject's rate of recovery against the level of resistance, it is possible to judge the approximate level of resistance at which the subject would manifest a given rate of recovery. There is promise that eventually we shall be able to state where in the entire range of the subject's reactivity, and of his 0–100 per cent recovery, he happens to be at any single instance of

reaction. In an attempt to compensate for the effect of the magnitude of reaction upon rate of recovery we have tried dividing recovery by reaction, giving us a *recovery-reaction quotient*. In this measure are accentuated the effects of such things as mental tension or anxiety, which tend to enhance reaction and retard recovery. Correlations appear with certain "neurotic" symptoms.

Pavlov's Theory of Cortical Irradiation in the Light of Some Recent Experiments with Conditioned Reflexes. ROGER BROWN LOUCKS, Phipps Clinic, Johns Hopkins Hospital.

Pavlov's theory that an inhibitory process (or an excitatory process) "initiated in a definite point of the cortex . . . irradiates into the surrounding region, giving a smaller inhibitory effect with increase of distance from the inhibitory point" is perhaps the most fundamental doctrine that has come out of his thirty years' work in conditioned reflexes. It is the keystone in his explanation of learning, initial "generalization" of newly established habits, sleep, hypnosis, psychoses. One weakness of the theory is that it rests on such questionable concepts as definite cortical points, specific connections, gradually marked out paths, decremental propagation of nervous processes. A yet more fundamental objection to the theory is that it postulates mere anatomical contiguity as the basis for the propagation of neural disturbances. Such extreme simplification disregards the functional unity of the nervous system, and ignores the time relationships involved in neural activity. It should be noted, moreover, that the experiments brought forward by Pavlov as evidence of irradiation are not critical proof of his theory since they can be explained on the basis of local signs. It is of some interest, however, that in similar experiments on the so-called "initial generalization" of a tactual stimulus we do not find a smaller excitatory effect with increase of distance from the point of original stimulation. It appears that when a conditioned secretion has been established to the tactual stimulation of one spot on a dog's thorax, the very first stimulation of a new point elicits an equally large "conditioned secretion." Furthermore, similar "conditioned secretions" are given upon the very first application of an auto hooter, and of a hissing noise. There was no evidence to show that the initial stimulation of more distant spots results in smaller secretions than loci nearer to the originally conditioned place. In the present investigation not only were the individual stimuli given automatically, but a master control device or

robot administered the stimuli at predetermined intervals, actuated the food box, and started and stopped the tape recording chronograph in connection with each stimulus.

Differentiation of Reflex and Voluntary Responses of the Lid. HELEN PEAK, Yale University.

Increasing interest in the relation of the conditioned reflex to unconditioned reflexes and to voluntary responses makes necessary the accurate investigation of the characteristics of reflex and voluntary behavior and examination of the criteria of differentiation. "Reflex" and "voluntary" are not regarded as distinct categories but are used as convenient terms for designating reactions lying at distinguishable modes in a distribution, when behavior is measured in certain dimensions. It has been reported elsewhere that subjects instructed to wink voluntarily to a loud noise give two responses: one at short latency, another at longer latency. Under experimental relaxation the first response is usually the only one. The longer latency reaction, being correlated with the set to react voluntarily, is called "voluntary" and the shorter, "reflex." In the present experiment we have studied the relation between latency, amplitude, and configuration of lid response and the modifiability of the configuration by instructions, in order to determine the distribution of responses, when measured in these dimensions, and the correlations between dimensions. Movements of both the upper and lower lids in response to a noise stimulus were recorded photographically. Four sets of instructions were given to different subjects: (1) to fixate a light, no reference being made to lid opening; (2) fixation, with instructions to prolong reflex lid closure; (3) fixation with instructions to wink voluntarily to a noise, no reference to opening; (4) same as (3) with instructions to terminate closure as quickly as possible, opening eyes immediately. Six thousand records from upper lid indicate: (a) lid responses of short latency show prompter opening of lid than those of long latency. (b) The short latency closures show smaller average amplitudes than long latency closures. (c) Under instructions to open eyes promptly after voluntary closure, long latency closures showed gradually increased promptness of opening, though the prolonged closure response reappeared frequently even at end of practice. (d) Instructions to prolong closure after reflex response produced a secondary closure resembling the usual voluntary response in latency and configuration. The latency of this secondary reaction decreased progressively with practice.

(e) Latency, amplitude, and configuration seem to be satisfactory criteria of distinction between reflex and voluntary response of the upper lid under most of the experimental conditions established here. Configuration and latency of voluntary response approach the modes of reflex response only after considerable practice.

Negative Adaptation as an Active Positive Antagonism. G. R. WENDT, Yale University.

Contemporary viewpoints with regard to negative adaptation fall into three classes: (1) ascribing it to an active inhibition, (2) ascribing it to a mechanism similar to a prolonged refractory phase, (3) stating it as a law of behavior with no attempt to account for its mechanism. The writer has secured evidence that response decrement with repetition of specific stimulation can be due to the development of an active positive neuromuscular antagonism. Forty normal subjects were repeatedly rotated through an arc of 75 degrees under constant conditions. A controlled ready-signal was used. Photographic records of the eye-movements during rotation were taken by means of mirror recorders. Typical vestibular nystagmus is a slow compensatory drift of the eyes which is interrupted at intervals by rapid saccadic movements bringing the eyes back near the primary line of regard. The slow phase is probably reflex (of brain-stem origin) while the fast phase arises from higher levels (cortical). Repetition of rotation decreases the amplitude of the nystagmus. This is brought about by the increasing frequency with which the saccadic phase breaks into the reflex. The alternation is compensatory and saccadic corrective movement finally reaches a point where there is little displacement of the eyes. The decrement is thus seen to be due to a centrally aroused antagonism. The angular velocity of the compensatory (reflex) phase *shows little change on repetition,* the adaptation being due to a more frequent antagonism by the higher level. The evidence shows that the adaptation is conditioned on a complex adjustment perhaps best described by the word "set." It is found to be highly specific to the particular situation which has been repeated. Omission of the ready-signal, for example, reinstates normal nystagmus. Any change in the characteristics of the rotation has a similar effect. The saccadic correction-process which gives rise to this response decrement is apparently the same as that which appears as anticipatory reaction or as "conditioned responses." No distinction can be drawn between the saccadic movements responsible for the adaptation decrement and those which are anticipatory of

rotation. For this situation, therefore, ***conditioning and negative adaptation are identical.*** No claim is made for the universality of such positive antagonism. My experiments on the knee-jerk indicate that negative adaptation may also be due to the development of an active central inhibitory process.

PROGRAM C

THURSDAY, SEPTEMBER 10, 2:00 P.M.

ROOM 8, GROUND FLOOR

EDWARD S. ROBINSON, *Chairman*

A Simple Technique for the Correlation of G-Factors. THOMAS VERNER MOORE, Catholic University.

Delayed Recall. FRANKLIN O. SMITH, Montana State University.

Religious Training and Delinquency. G. R. MURSELL, State of Ohio Bureau of Examination and Classification.

Relation Between Recall and Galvanic Resistance After Electrical Shock. M. M. WHITE, University of Kentucky.

The Influence of Punishment During Learning upon Retroactive Inhibition. MARION E. BUNCH, Washington University, and FRANCES C. DAVIS, Merrill-Palmer School.

Retroactive Inhibition and Suggestion. MILDRED B. MITCHELL, George School.

A Further Analysis of the Phenomenon of Reminiscence. GRACE O. MCGEOCH, University of Missouri.

Factors Affecting Variability Changes in Learning: A Preliminary Report. JOSEPH PETERSON, George Peabody College for Teachers.

A Technique for Testing Ability to Learn Some New Relationships. JAMES L. GRAHAM, Lehigh University.

PROGRAM A

FRIDAY, SEPTEMBER 11, 9:00 A.M.
EAST HALL, SECOND FLOOR
HARVEY A. CARR, *Chairman*

The Behavior of White Rats in a Rotated Tunnel Maze. C. K. TRUEBLOOD, Brown University.

Seventy-eight white rats of two different strains, 53 of one strain and 25 of another, were trained to traverse a tunnel maze in which they were prevented from being affected visually by the external environment of the maze. On the completion of training, they were subjected to rotations of the maze to various positions of the compass. With the twenty-five animals of one strain the disturbance customarily appearing in the behavior of the animals upon maze rotation, was eliminated. With the 53 animals of the other strain it was significantly reduced, both in numbers of animals disturbed, and in degree of disturbance exhibited by individual animals, as measured by the number of trials in which confusion was shown. From these and other experiments to be reviewed in the paper the inference is drawn that the maze performances of the white rat are a form of homing behavior in which the receptors of the animal are affected, and its consequent orientation determined, by at least two, and in most cases three classes of stimulation: (1) the stimulation from the home cage; (2) the stimulation from the maze; (3) the stimulation from the environment external to the maze. During training the animal becomes conditioned to a fixed set of relations obtaining between these three classes of stimulation. Rotation of the maze or the cage disrupts these relations and disturbs the animal. Elimination of such disturbance is accomplished by excluding the influence of the external environment of the maze on the receptors of the animal, and by preventing the alteration of the relations between maze and home cage stimulation which rotation ordinarily causes. Such a result is attained for many animals, either by making the home cage continuous with a semi-enclosed maze, or by the tunnel maze technique described.

The Development of the "Concept" of Triangularity in the White Rat. PAUL E. FIELDS, Stanford University.

A group of eleven rats was given 35,000 trials on a discrimination apparatus of modified Lashley type. During this time more than 75

stimulus cards, each giving a slightly different retinal pattern, were used. These were in turn presented in many combinations with one element of the total pattern usually involving the quality of triangularity. Important differences in the nature of the reaction obtained on the "running" and on the "jumping" apparatus were demonstrated. After having been trained to jump to an equilateral triangle with apex up when placed in combination with a circle of equal area, (a) The rats react only to the shape and not to the size or brightness of the figures. (b) They will continue to jump to this triangle, disregarding the other member of the combination. (c) A change in position of the triangle by a rotation of more than ten degrees is sufficient to cause a reversal of the original response. The direction as well as the amount of rotation is important. (d) Rats jumped to the triangle when it was exposed with a blank card, and jump to this same blank when exposed with a circle. (e) These rats have reacted to the outer (most inclusive) figure when one solid geometrical figure is inscribed in another. There is a progressive decrease in the number of trials required to learn each new position of the equilateral triangle when presented with a circle. Accuracy of this response then varies but little with substitution of other figures for the circle. Later substitution of right angle for the equilateral triangles does not affect the accuracy of response. When presented with cards on which a number of small geometrical designs were arranged in various configurations, the rats quickly reacted to those spatial arrangements which possessed the quality of triangularity, although no actual triangle was present. The rats' behavior records indicate that they may have the ability to form "concepts"; or stating it more conservatively, the white rat can establish positive reactions to a very large number of retinal patterns and to qualities inherent in them. The acquisition of these new reactions does not interfere with the retention of those previously learned.

The Effect of Cortical Lesions on Reasoning in Rats. NORMAN R. F. MAIER, University of Michigan.

The results of a study of reasoning in rats with cortical lesions in the anterior half of the brain have been previously reported. It was found that the ability to combine the essentials of two isolated experiences was affected seriously by lesions involving 18 per cent or more of the cortical surface, but only slightly by lesions less than 18 per cent in extent. The present report is concerned with the study of reasoning in rats with cortical lesions in the posterior half of the

brain. As 18 per cent seemed to be a critical mass, most of the lesions were made so as to involve approximately this amount of tissue. Thus 30 of the 48 cases involved between 16 and 25 per cent of the exposed surface of the cortex. It was found that lesions involving 20 per cent or less of the cortex in the posterior half of the brain had little effect on the reasoning score. All of the rats passed the tests. Lesions involving 23 per cent or more of the cortex, however, greatly affected the score. All rats with such lesions failed the test. Only 3 of the 11 cases with lesions between 21 and 22 per cent in extent failed to pass the tests. Blind rats succeeded in passing the tests. Thus we find that (1) mass of tissue and reasoning (ability to combine the essentials of two isolated experiences) are highly correlated and (2) the cortical mass is about 5 per cent higher for the posterior than for the anterior half of the brain when extent of lesion is measured in terms of surface.

The Relation of Hunger and Activity Drives in Maze Running by Mice to the Factor of Habituation. MARGARET F. WASHBURN, Vassar College.

In 1926 the writer published a study in which the daily speed of running a maze (total distance traversed divided by time) for each of the members of a group of white mice was measured, and its daily amount of eating on reaching the goal recorded in terms of the time it spent in eating. The results showed (1) that those individuals whose fastest days were their hungriest days were those whose fastest days were those on which they made fewest errors, and (2) that those individuals with lowest speed-correctness day-to-day *r*s tended to be those with highest average speed. It was concluded that the mice with highest hunger-speed *r*s and speed-correctness *r*s were driven by hunger, while those with lowest hunger-speed *r*s and speed-correctness *r*s and highest average speed were driven by the urge to activity. A mouse running for the sake of running would get as much satisfaction out of incorrect as out of correct runs. The experiment was of interest as being the first to analyze the factors involved in the maze-running drive. It later occurred to the writer that these *r*s might be spurious, due to the common factor of habituation, whereby an animal would tend to eat more and run faster in later than in earlier experiments, and of course to make fewer errors. "Habituation" is here used to include both learning and the disappearance of emotional disturbance as the situation becomes familiar. The obvious means of determining whether this factor invalidated

the conclusions previously drawn was to partial out of the factor of time sequence, finding for each mouse the *r*s between time sequence and daily eating, daily speed, and daily correctness respectively. The present paper reports the use of this method with more than forty additional mice. The results confirm strongly those of the former study; the correlations do not depend on the factor of habituation, and the conclusions of the earlier study are thoroughly justified by the present one.

A New Technique for the Study of Relative Food-Preference. PAUL THOMAS YOUNG, University of Illinois.

Rats were given a free choice between pairs of foods exposed for one second in glass tubes. The behavior of the animals in the presence of the foods was carefully noted and recorded. Hunger, diet and other factors were kept constant. Some of the main results are the following: (1) Foods arrange themselves into a genuine series from high to low preference. When the position of a food in the series is known its preferential value with respect to any other food in the series can be predicted. This principle has been repeatedly confirmed. It is assumed that for a given physiological state some food-drives are prepotent over others in motivating behavior. (2) Eighteen rats in two experimental groups were markedly uniform in their preferences, indicating that a preferential order may be characteristic of the species. Preferences were relatively stable for a period of forty consecutive days. (3) Two foods near together on the preferential scale showed mutations in preference during a twenty-minute observation period. The conditions determining these mutations are as yet unknown, but the facts indicate a delicate physiological balance which may swing one way or the other. It may be noted that various studies on animals and man have indicated that cravings and aversions for specific foods are related to dietary demands and deficiencies. (4) Factors other than food-preferences affect the results. Some of these are manner of approach to the food, habits of head movement during eating, space preference, ease of discriminability between a pair of foods. Despite such factors food-preferences were easily recognized. The techniques developed make possible an objective study of the various conditions determining food-preference. The food-preferences of the white rat are uniform and lawful. The field is rich for future experimentation.

PROGRAM B

FRIDAY, SEPTEMBER 11, 9:30 A.M.
WEST HALL, SECOND FLOOR
WALTER R. MILES, *Chairman*

The Facilitative and Inhibitory Effects of Muscular Tension in Mental Work. G. L. FREEMAN, Yale University.

Problem: When does muscular tension facilitate performance and when is it likely to be inhibitory? The present report describes several new approaches to this question and suggests means of reconciling certain contradictory results of the past. The first experiments related the tonus accompaniments of variations in "mental effort" with performance. Changes in quadriceps tension were photographically recorded during (a) several types of work, (b) several degrees of task-difficulty, and (c) differences in motivation. The results indicate that the facilitative effect of tension on higher functions is modified by the type of performance and reactor under survey. The work-output of simple tasks (such as finger-oscillation) apparently increases in proportion to the amount of recorded tension. On the other hand, tasks requiring a high degree of neuromuscular coördination may be inhibited by the presence of hypertension. Knowledge of task-difficulty increased anticipatory tension as well as the accuracy of performance. The motivation of subjects (competing for a money prize) influenced both tonus and work-output; discouragement lowered tension and output; overencouragement increased tension but decreased accuracy. The second group of experiments studied the effect of varying degrees of tension upon performance. "Discrimination" and "reflex" reactions to two intensities of electric shock were recorded during (a) relaxation, (b) subject alert, and (c) hypertension (resulting from the condition of the antigravity muscles consequent to throwing the subject slightly off-balance). Relaxation lengthened reaction time, shortened extent of finger withdrawal, lowered sensory thresholds and decreased accuracy of discrimination. Hypertension also decreased accuracy; reflex withdrawal, however, tended to be more rapid and of greater amplitude. Additional experiments explored (1) the effects of progressive relaxation on a complicated task and (2) the question of whether more or less facilitation is present when tension is localized in muscles not primarily involved in the execution of the task. The

above observations indicate that the facilitative effect of tension is definitely limited. They suggest further the hypothesis that while higher neural integrations demand a certain amount of sustaining muscular action for their proper functioning, an excess of such action—by its very prominence in the neural flux—is accompanied by disorganization.

The Effect of Tobacco on the Secretion of Smokers and non-Smokers.
A. L. WINSOR, Cornell University.

Wherever the behavior of smokers and non-smokers has been compared in well controlled experiments showing tobacco effects, interesting differences have been reported. In certain types of behavior smoking has been observed to improve the reaction of the non-smoker while it was observed to have a retarding influence on the same kind of behavior with the smoker. In order to understand these results it seemed desirable to make a further study to determine if possible the nature of the fundamental adaptive processes involved. It appeared important to ascertain first whether tobacco caused excitation or inhibition of the digestive functions, and second whether habituation involved a change from excitation to inhibition; from inhibition to excitation; or facilitation of one or the other of these basic processes. A quantitative study was undertaken in which the normal secretion of the parotid glands was used as a basis for determining secretory changes. Both smokers and non-smokers were used as subjects. In the case of the non-smokers, smoking was followed by a period of inhibition of secretion. In the case of the smokers, smoking was followed by a period of increased excitation. The onset and duration of the subsequent period of increased or decreased secretion was determined. These data were interpreted as evidence that the initial effect of tobacco is inhibitory as far as glandular behavior is concerned and that habituation is a process by which inhibition is replaced by excitation of secretion. Psychologists frequently state that strong emotions act much like drugs without knowing just how drugs act. Here is evidence that drugs act much like emotions and, according to Cannon's emergency theory, these results would account for the improved behavior of the novice smoking for the first time and they might explain the difference in the affective state of the individual who smokes for the first time and the individual who has become habituated. The technique affords a new approach to the study of drug effects on the human subject.

The Psychological Effects of Oxygen Deprivation (Anoxaemia) on Mental and Emotional Behavior. R. A. McFARLAND, Columbia University.

This research is concerned with the psychological effects of oxygen deprivation (anoxaemia) in human subjects. The deterioration of simple and complex mental processes, as well as emotional and personality changes, have been studied under controlled conditions by depriving subjects of oxygen corresponding to the oxygen percentages existing at high altitudes. The gas mixtures which the subjects breathed were made in a 1,000-liter Douglas breathing bag by running in compressed air and nitrogen through a gas meter. Eighteen subjects took the series of tests, breathing gas mixtures of from 10.80 to 7.60 per cent oxygen. Each subject came six times, starting at approximately 10.80 per cent oxygen and at each succeeding experimental hour the oxygen content was decreased until the individual's limit was reached. Controls of normal oxygen were introduced from time to time so as carefully to determine the actual and not imagined effects. During each experimental hour the subjects were given simple and choice reaction time tests, memory and form board tests, the pursuit meter, and a test which involved rolling a ball bearing up an inclined plane full of holes with a knitting needle. In the simple reaction tests the changes were not marked until the subject was deprived of oxygen corresponding to very high altitudes. In a number of cases there was noticeable acceleration accompanied by a restriction in the field of attention. In the choice reactions there was a marked deterioration of function with decreased oxygen beginning in the neighborhood of 10.12 per cent. The reactions were much slower and the effect quite insidious; the subject, although making many errors often thought he had done very well. There was a marked loss of memory for most subjects able to go beyond 10.12 per cent oxygen and also serious impairment in solving the form boards. The lack of effort needed in carrying out the task was quite as noticeable as the loss in accuracy in putting the form boards together. The Pursuit Meter showed quite clearly the loss in neuromuscular control as the subject was increasingly deprived of oxygen. In the last test involving the rolling of the ball bearing past the holes and barriers on the inclined plane there were marked temperamental and emotional reactions, especially when the oxygen mixtures were reduced to 9.40 or 8.30 per cent. There were great individual differences in the emotional outbursts and breaking down of inhibitions. The personality alterations were characterized especially by indifference, mental

apathy and lack of will and the inability to notice the markedly impaired behavior. The reactions were often similar to the fatigued, unreasonable and neurasthenic person suggesting that in such cases oxygen want may be a significant factor in the distorted personality.

Psychological Changes in Normal and Abnormal Individuals Under the Influence of Sodium Amytal. ERICH LINDEMANN, State University of Iowa.

Sodium amytal, a derivative of barbituric acid which for several years had been used as an anesthetic, was found by Lorenz and Bleckwenn to produce marked changes in the behavior of patients suffering from catatonic or depressed stupor. The patients having fallen into a deep sleep under the influence of this sedative had periods of normal behavior, good emotional contact with the outside world, and gave information about their thoughts and the subjective reasons for their abnormal behavior. In the psychological laboratory of the Psychopathic Hospital we made an effort to investigate the effect of this drug in various psychotic conditions, and to correlate our findings with the psychological changes in normal individuals. We found that a very small dose of the drug, not sufficient to produce sleep, can within a few minutes have the effect of changing catatonic stupor into a condition of friendly communication with the outside world. This same dose (4½ to 6 grains given intravenously) produces in a normal individual a state of serene contentment, a warm emotional attitude toward persons of the environment, a desire to communicate private matters which are usually kept hidden, and an inability to refuse giving the answer to questions about intimate matters of personal life. While subject shows all the symptoms of fatigue, the introspective reports tell about feelings of strength, of pleasant anticipation of future activities, and of self-confidence. The drug does not produce any hallucinations; it applies more than any other known drug solely to the emotional attitude toward the outside world. It attacks most probably the basal ganglia. One can expect this drug to be of importance for the psychological analysis of abnormal mental conditions and for the psychotherapeutic efforts in psychosis.

The Extent and Duration of Experimentally Induced Amnesia. WESLEY RAYMOND WELLS, Syracuse University.

There is a long history of clinical evidence (hysterical amnesias, double personalities, etc.) for the presence of complete recognition and recall amnesias in cases where retention is still unimpaired.

There is also a long history of experimental evidence (hypnosis) for the same thing. A recent tendency, however, has been to question the validity of clinical observations, and the accuracy of experimental evidence from the field of hypnosis, on the ground that such observations and experiments have not been sufficiently quantitative. Recent hypnotic experiments have been reported in which hypnotic amnesias have turned out on quantitative test to be less than 100 per cent, and in which the duration of posthypnotic effects has been slight. An experiment was undertaken in April, 1930, with four subjects selected from 140 students. Amnesia, both recognition and recall, and a relearning inability, were produced for nonsense syllables learned in the hypnotic state (two cases) or in the normal state previous to hypnosis (two cases). With all four subjects the use of hypnosis on a single occasion was sufficient to produce by quantitative test not only 100 per cent recognition and recall amnesia but also a total inability to relearn any of the syllables for the full period of a month. Then a similar experiment was undertaken to run a full year, and the results obtained were the same (with three subjects, the fourth not returning to college the next year). Complete retention was proved by test after recognition and recall amnesias were removed at the end of the month and the year. Complete recognition and recall amnesias and relearning inability during the experiments were established by tests at regular intervals. Comparisons were made with a control list of nonsense syllables, learned and relearned under normal conditions. The results of the experiments are a quantitative confirmation of clinical observations and earlier hypnotic observations. Failures to get hypnotic results are easy, but such failures should not be accepted as defining the limits of hypnotic effects. The subjects selected for the present experiments were sufficiently good subjects to establish that hypnotic amnesias may be 100 per cent complete, that relearning may be completely inhibited, and that posthypnotic effects may last with 100 per cent efficacy for at least a year.

PROGRAM C

FRIDAY, SEPTEMBER 11, 9:00 A.M.
ROOM 8, GROUND FLOOR
SAMUEL W. FERNBERGER, *Chairman*

Concerning the Question of Cross Rhythms. PAUL R. FARNSWORTH, Stanford University.

The Influence of Language upon Changes that Take Place in the Reproduction of Visually Perceived Form. LEONARD CARMICHAEL, Brown University.

Simultaneous Contrast and Other Phenomena in the Perception of Curved Lines. JAMES J. GIBSON, Smith College.

Developmental Changes in Non-Foveal Perception of Line-Patterns. M. BULLARD DRURY, Cornell University.

Brightness Contrast and the Perception of Shadow. R. B. MACLEOD, Cornell University.

Further Experimental Work with the Conditioned Knee Jerk. HAROLD SCHLOSBERG, Brown University.

A Search for Cutaneous Termal Receptors under Improved Technique. JOHN G. JENKINS, Cornell University.

Relationships of Pitch, Intensity and Auditory Acuity. JAMES P. PORTER and WARD C. HALSTEAD, Ohio University.

The Objective Measurement of Emotional Reactions. HAROLD V. GASKILL, Iowa State College.

PROGRAM A

FRIDAY, SEPTEMBER 11, 2:00 P.M.
EAST HALL, SECOND FLOOR
ARNOLD GESELL, *Chairman*

Differential Reactions to Taste and Temperature Stimuli in New Born Infants. KAI JENSEN, Connecticut Agricultural College.

The absence of language responses in the newborn infant has restricted the investigation of just those problems which are the basis

of adult behavior. If some substitute for such responses could be secured, a new field of inquiry would be opened and light shed on many problems which had not even been formulated. In seeking an objective procedure which might serve, at least as a partial substitute, for such language behavior, a new experimental technique was developed which involved the use of a fundamental behavior mechanism, the feeding reaction, as an indicator of the infant's responses to controlled stimulation. This technique consists in comparing sucking reactions to various experimental stimuli with a control sucking reaction, all curves being objectively recorded. The controls being identical, any deviation from the control curve by the experimental curve was interpreted as a differential reaction. The order of presentation of both experimental stimuli and controls was continually varied to avoid space-time errors and as a check on positive and negative adaptation. The apparatus used automatically recorded time, sucking curves, and the pressure volume changes involved in the feeding reaction. Seventeen infants were studied from birth through the first twelve days of life. Each infant was observed during four feeding periods each day. The infant was brought to the experimental room one-half hour before feeding and kept there one-half hour after feeding during which time it was under constant observation. Only one infant at a time was experimented with so that the period of investigation extended over several months. A total of 2,331 experimental and 2,975 control stimulations were used. Upper and lower temperature thresholds and differential thresholds for taste stimuli were secured in the case of all infants studied. Large individual differences in thresholds were found. The nature of the differential reactions involved was analyzed and six distinct types were classified. These differential reactions were not an "all-or-none" proposition but proved to be gradual deviations from the control curves, becoming more marked as the temperature and taste stimuli were increased in strength. The objective data which were obtained in these researches are presented in the form of lantern slide copies of the original unretouched records. The experimental technique itself is recorded in a special moving picture film.

Generalization and Specificity of Behavior in the Newborn Child. KARL C. PRATT, Ohio State University.

According to the Watsonian behaviorist the infant presents, on the behavior side, a number of unorganized but quite specific reflexes and a few complex specific patterns which under environmental influ-

ence become integrated into those behavior patterns characteristic of a given age level. That the "specificity" of the response may have been determined by other criteria than the response itself has been demonstrated by Sherman. No less extreme is the view that the activity of the newborn infant is chaotic and unorganized. The concept which harmonizes best with the observed genetic changes in behavior is that the developing organism shows generalization in the initial stages with individuation of reflexes as development proceeds. The latter view makes it necessary to differentiate if possible a specificity arising from growth processes and one which is acquired by learning. If the terms "specificity" and "generalization" are to have utility in the description of behavior they must be rigidly defined. Bersot and Minkowski have applied them to the limits of reflexogenous zones and to the number and variability of segments participating in the response. Irwin and Weiss have defined "specificity" in terms of localization and observability of the response. It is questionable whether this latter criterion has valuable descriptive validity. Investigation of the plantar response, the sucking reflex and of the response to auditory stimuli during the first twelve days of life make it apparent that "specificity" is a relative term. That is, limitation or localization of response may from one angle be regarded as "specific" and from another "generalized" according to previous or subsequent degree of localization. Thus if excitation of the plantar surface results in homolateral activity of the toes, foot, lower and upper leg we may term it "specific" as compared with a condition wherein stimulation of the plantar surface results in homo- and contra-lateral activity of toes, feet, legs, trunk, etc. On the other hand it would be "generalized" as compared with a condition in which such stimulation results in homolateral activity of the great toe only. But localization or limitation of response cannot be made the sole criterion of "specificity." If stimulation of this given point now results in activity of the great toe, now that of the little finger, now winking, etc., it could scarcely be said that we were dealing with a specific response. Frequency of occurrence of a given response must be considered an even more significant criterion.

Double Alternation Behavior of Monkeys, Human Infants, and Chimpanzees in a New Alternation Box-Apparatus. LOUIS W. GELLERMANN, Yale University.

Double alternation behavior in the *temporal maze* has been investigated with rats and raccoons by Hunter and with monkeys and human subjects by Gellermann. The present paper reports three further

experiments in which a new *alternation box-apparatus* was utilized. This apparatus consists of two small boxes built inside a cage upon the top of a table. During the experiment the subject sits before or between these boxes, and should open their lids in the order *R R L L* and thereby secure bits of food. The apparatus includes mechanisms which enable the experimenter to control the order in which the boxes may be opened, and to introduce quickly new bits of food into the boxes. In the actual operation of the apparatus visual, auditory, and olfactory factors are identical preceding each response. The apparatus is adapted to the study of the double alternation problem in much the same way as is the temporal maze, in that the response of opening a box, taking food, and allowing the lid of the box to close is equivalent to a trip around one side of the temporal maze. The present experiments confirms the position taken by Hunter concerning the relationship of the double alternation problem and the delayed reaction experiment, and the explanation of the performance of the former problem in terms of symbolic processes. Some aspects of the behavior of the different subjects during these experiments (tendency toward simple alternation, ability to learn double alternation, and ability to extend the double alternation of responses beyond the length of the training series) indicate that in these types of behavior a kind of ability is required that is present in highest degree in human subjects and is less and less in evidence as we descend the genetic scale. On the other hand certain other types of behavior exhibited by different subjects while learning double alternation (tendency to maintain a direction, and ability to associate the first response and entrance) apparently involve a different kind of ability. In these types of behavior the different subjects fall into a series almost the opposite of the one suggested above. Presumably the former ability is of the symbolic type, and the latter ability is that required in ordinary habit formation of the spatial maze type. The results show that the alternation box-apparatus may be placed with the temporal maze as a valid method of testing for ability to perform double alternation and thus for demonstrating the presence of symbolic processes.

The Anatomical and Behavioral Development of a Female Chimpanzee During the First Year of Life. CARLYLE JACOBSEN and JOSEPH YOSHIOKA, Yale University.

A female baby chimpanzee, for whom the gestation period and birth date are known, has been reared in the Laboratories of Comparative Psychobiology of Yale University, under conditions similar

to those of a bottle fed human infant. Intensive observations have been made of the anatomical, physiological and behavioral development. The various criteria of growth and of behavioral development indicate marked acceleration in the rate of growth of the chimpanzee during the first half year in comparison with the human infant. This was followed by a deceleration in the second half year. The birth weight doubled in three months; trebled in six months. The milk teeth, except the canines, had erupted at six and one-half months. X-ray examination of the centers of ossification showed slight advance over the human at three months, marked acceleration at six, and a noticeable decrease in rate during the subsequent period. Pulse, respiration and temperature were irregular during the first weeks, becoming fairly well stabilized by the fourth month. The Babinski reflex could not be elicited at any time. When tested periodically on the Gesell developmental scale, the chimpanzee showed, in comparison to the human infant, definite acceleration on the motor behavior items up to the eighteen-month tests, a less pronounced advance on the items of adaptive and personal-social behavior up to the twelve-month tests. The order in which the behavioral items were passed was the same as in the human infant. The behavioral development closely parallels the physical growth, and indicates a high correlation between the anatomical and physiological maturation and the behavioral level.

The Development of Behavior in the Fetal Cat. JAMES D. CORONIOS, Brown University.

This experimental study is an attempt to trace systematically the development of behavior in the fetal cat from the time of the first observed movement to normal delivery at birth. The pregnant adult is decerebrated under ether anesthesia. A period of an hour and a half follows decerebration to allow the effects of the anesthetic to pass away. The cat is then partially immersed in an appropriate bath of physiological salt solution kept at a constant temperature of 37.5° C. One fetus at a time is shelled out into the warm solution, the umbilical circulation maintained intact. Under these conditions it is possible to observe the fetal animals for from four to six hours. The experimenter's written protocols have been supplemented by motion-picture records. After what may be termed the non-motile stage, 21–22 days after fertilization, the first movements were observed on the twenty-third day. These movements consisted of a slight unilateral flexion of the head, a weak lateral flexion of the fore legs, and movement of the trunk. On the twenty-fifth day barely

perceptible rump rotation was noted for the first time. Head extension, bowing of the whole body with slight flexion of the hind legs, appeared on the twenty-sixth day. On the twenty-ninth day the following changes in behavior were observed: (1) bilateral flexion and rolling of the head, (2) alternate flexion-extension of both fore legs, (3) "serpentine" twists of the whole body, beginning at the head and proceeding caudad, (4) twitch of the tail, (5) bending in of back, (6) independent skin twitching, (7) ventrolateral flexion of the head, and (8) opening and closing of the mouth. The only observed change in behavior on the thirtieth day was the first appearance of sucking movements. On the thirty-eighth day there first appeared the rudiments of the scratch reflex and bilateral extension-flexion of both hind legs. At this stage the "serpentine" twisting movements have disappeared. Individual movements of various parts of the body were easily elicited by appropriate stimuli in contrast to the diffuse behavior of the total organism in the early motile stages. As the gestation period advanced the fetal movements became more generally complex. In general the fetal movements seem to progress from diffuse behavior of the total organism toward individualized, relatively independent responses of isolated parts. With a few exceptions the fetal behavior seems to follow an anterior-posterior course of development.

PROGRAM B

FRIDAY, SEPTEMBER 11, 2:30 P.M.
WEST HALL, SECOND FLOOR
LEWIS M. TERMAN, *Chairman*

The Relation of Exposure Times to the Interval Between Exposures in Apparent Visual Movement. C. R. GARVEY, Yale University.

By apparent visual movement is meant the movement which is perceived when one light, or visual object, is suddenly replaced by another in a slightly different location. In most of the work on this subject there has been a time interval between the successive objects. Korte has formulated laws involving the rôle of this interval. In some cases, however, the interval is omitted, the beginning of the second exposure being simultaneous with the termination of the first. Hillebrandt and Higginson conclude that, since movement is also apparent in these cases, the interval has no function and Korte's laws are artificial. The present experimenter has been able to show, by

means of a new apparatus, that the cause of the controversy lies in the difference between Korte's and Higginson's experimental conditions. The total time for Higginson's pair of exposures is ten seconds, five for each exposure, with zero interval between. The exposure times and intervals in Korte's experiments are small fractions of a second. The present results show that clear movement is apparent with long exposures and no interval, but that when the exposure times are made very brief, the interval becomes necessary. It is as if a certain amount of time were required in the stimulus situation and some of this time could be given over to an empty interval. If the total time including the interval is just equal to the minimum essential, then the elimination of the interval by pulling the exposure times together will reduce the total time below the minimum essential and destroy the movement. This is true in a general way and the term "as if" is used advisedly, since the necessary total time is not necessarily a true sum of the exposures and the interval if any. The rule probably does not operate in such a simple additive fashion, since interval and exposure time may have different weights. This exception is a minor consideration, however, the main conclusion being that the interval is necessary with very short exposures and unnecessary with longer exposures. The disagreement of Higginson with Korte, Wertheimer, and Koffka is thus shown to be a function of the difference between the conditions of their experiments.

The Sensory Chronaxy of the Skin. KARL M. DALLENBACH, Cornell University.

With the coöperation of Dr. A. Rizzolo, a preliminary series of experiments was made to study the sensory chronaxy of the skin. The measurements of the chronaxy times were made with a Lapicque chronaxiemeter. Various areas of the skin of different observers were explored. The rheobase and the sensory chronaxy times were both established in ascending series of experiments. The rheobase was found to differ greatly from observer to observer, and in the same observer from area to area. The voltage of the rheobase varied with the skin conditions: thick and dry areas gave a high, and thin and moist areas gave a low rheobase. The size of the rheobase did not vary with the sensitivity of the area stimulated; the finger tips, for example, gave higher rheobases than many areas less sensitive. The chronaxy times were practically constant for all the areas examined, varying for different areas, and for the same area at different times from 0.1 to 0.3 σ. The quality of the just noticeable experience aroused in the chronaxy measurements varied, among the observers

and areas stimulated, from a dull pressure to a sharp prick. Unsuccessful attempts were made to stimulate, and to determine the chronaxy of warm and cold spots.

The Dependence of Auditory Experience upon Wave Amplitude. FORREST L. DIMMICK, Hobart College.

In this experiment we have undertaken to compare in some measure the DLs for tone given by Knudsen and by Fletcher with those obtained by the more usual psychological method of discrete judgments, and to determine the bases upon which judgments of intensive differences are made. Knudsen and Fletcher calculated their liminal values from the least audible fluctuations, or beatings of a continuous tone. There is no reason to assume that determinations of this sort are psychologically of the same order as those obtained by judgments of likeness or difference in intensity of two successive tones. While we did not attempt to reproduce Knudsen's or Fletcher's experiments, we set up conditions for our type of judgments that closely approach theirs in adequacy of control of the physical stimulus. We confined ourselves to the determination of the intensive DLs for a single frequency, 256 vds., at four amplitudes, —51db to —41db, with six Os. Our stimulus was almost perfectly sinusoidal and was presented equally to both ears from a normal frontal position. The psychophysical method employed was that of Constant Stimulus Differences. Our results give DLs 50 per cent to 100 per cent greater than Knudsen's or Fletcher's for the region in which we worked, though they agree in that the DL ratios decrease as the absolute values of the standards increase, thus indicating that the simple form of Weber's Law is not strictly operative. While the values of the fluctuating tone method measure a certain type of response of the auditory mechanism, they can not be taken as equivalent to the intensive DL as that term is used and understood in psychology. In the course of the experiments the Os were asked to give the bases upon which they were making their judgments. A report of difference in intensity is not the simple attributive discrimination that it has been assumed to be, but a complex perceptual judgment in which, at best, attributive intensity may form a fundamental part. Changes in two other attributive aspects, "brightness" and volume, were reported and their DLs indicate that the judgments are distinct from those of intensity. In addition, all Os frequently reported pitch changes. We were not able to separate this aspect from intensity as sharply as we did brightness and volume, but the results indicate a rise of pitch with increase of intensity. Our results emphasize the

need for a set of DL determinations by adequate psychophysical methods throughout the audible range of intensities and frequencies. It is apparent also that the assumed one-to-one relation between physical amplitude and psychological intensity is too simple to be adequate and that intensity judgments are perceptual judgments frequently involving attributive aspects other than intensity.

Some Configurational Properties of Short Musical Melodies. J. P. GUILFORD, University of Nebraska.

Configurationists have maintained as one of the important properties of a Gestalt that a change produced in one member influences all the other members. This assertion has been put to an experimental test in the following manner: Melodies of from two to six tones were played on a phonograph and then immediately repeated with one tone changed to the extent of a semi-tone. Seven Os attending to the melodies as a whole, reported whether each tone in the second playing was higher than, lower than, or equal to the corresponding tone in the first playing. A total of 175 judgments on each of 200 tones was secured. The outstanding results were: (1) When one tone in a melody is raised (or lowered) a semi-tone, it tends to carry the whole melody along with it; the other tones are also phenomenally higher (or lower) on the average. (2) The longer the melody, the less stable it is, that is, more phenomenal changes are reported, but the direction of the change is less influenced by the actual change of the altered tone. (3) The first tones of the melodies are on the whole most stable, the last tones come next, and the middle tones are least stable. (4) The tones preceding the actually altered one are changed along with it more than those following it, although those following it seem to be less stable. (5) No definite conclusion can be drawn as to the relation between the amount of apparent shift in a tone and its nearness to the one actually changed. (6) There is a slight tendency for the first tone of a melody to seem higher in the second playing and a more decided tendency for the last tone to appear lower the second time. (7) Other configurational effects appear as a result of the shape of the melody as a whole. These effects sometimes facilitate and sometimes inhibit the above-mentioned changes. They also sometimes apparently influence the degree of change observed in the tone that is actually changed. These results indicate the possibility of a thorough search for the dynamic interrelations between the members of a closed system, or Gestalt.

PROGRAM C

FRIDAY, SEPTEMBER 11, 2:00 P.M.

ROOM 8, GROUND FLOOR

CLARK L. HULL, *Chairman*

On the Summation of Estimates. HAROLD A. EDGERTON, Ohio State University.

Motor Abilities of Deaf Children. JOHN A. LONG, Coöperative Test Service, New York, N. Y.

Better Retention from Foreign Reading. L. W. COLE, University of Colorado.

Effect of Making an Occupational Choice on Scholastic Achievement. MINNIE LOUISE STECKEL, Alabama College.

Effects of Remedial Reading in Severely Retarded Problem Children. THORLEIF G. HEGGE, Wayne County Training School and University of Michigan.

Lateral Dominance and Reading Ability in an Unselected Public School Group. FORREST D. COMFORT, Harvard University. (Introduced by Walter F. Dearborn.)

The Relation Between Two Methods of Learning Piano Music. ROBERTA W. BROWN, University of Chicago. (Introduced by L. L. Thurstone.)

A Qualitative Study of Some Reactions of Infants During the First Year by Consecutive Motion Pictures. ORVIS C. IRWIN, State University of Iowa.

A Quantitative Study of Cheating among Elementary School Groups. GRAHAM B. DIMMICK, University of Kentucky.

A Study in Urging and Non-Urging of Preschool Children at Meal Time. HAROLD H. ANDERSON and ESTHER LEECH, Iowa Child Welfare Research Station.

PROGRAM A

SATURDAY, SEPTEMBER 12, 9:00 A.M.
EAST HALL, SECOND FLOOR
H. L. HOLLINGWORTH, *Chairman*

A Study of the Relative Influence of Training and Maturation in Young Children. A. T. JERSILD, Columbia University.

In this study over 200 children, ranging in age from two to ten years, were used to investigate the relative effects of maturation and training. The equivalent group method was used in connection with a variety of performances. The children were tested at the beginning of the study, and thereafter the experimental subjects were given practice over a period of several months while the control children received no training. At the end of the practice period both groups were again tested and compared. Following this an interval of three months or more elapsed during which time no practice was given to either group. Thereafter the children were tested once more to find whether those who had received practice maintained their advantage over those who had received none or whether the difference had been leveled in the normal process of growth. The specific performances used in the study, the number of children and the age of the children used with each performance follow: (a) Test of pulling strength; 36 cases; age, twenty-nine to forty-five months. (b) Test of strength of grip; 42, four to six years. (c) Tapping; 14, seventeen to forty-five months. (d) Test of lung capacity; 26, four to seven years. (e) Vocal reproduction of pitch; 36, twenty-nine to forty-five months. (f) Vocal reproduction of interval; 36, twenty-nine to forty-five months. (g) Color naming; 34, six to seven years. (h) Free association; 34, nine to ten years. The practice in music extended over a period of 5½ months; in the remaining tests, over a period of 3 to 4 months. Practice was given three days a week. The results at the end of the training period show that on all performances, except free-association, the practiced children scored higher than the controls who were equivalent with them when practice was begun. Only in the case of the tests of pitch and interval was the difference between the two groups reliable at the end of training. All groups scored substantially higher than on the initial tests. In free-association the experimental and the control groups made the same average score at the end of training. When the groups were tested again after the

further elapse of three months (pitch and interval excepted) only the children who had received practice in strength of grip maintained their advantage over the controls. (The later tests in music have not yet been given.) The results further indicated that improvement during training correlated positively with initial ability and with intelligence.

Growth Curves of Human Structure and Performance. EDWARD B. GREENE, University of Michigan.

Careful measurement of human maturation has two fundamental requirements, the equivalence of measuring units, and the location of zeros of development. To meet these requirements a scale has been designed, during the last three years, to evaluate motor speed and coördination, and observation and comparison of non-verbal objects. The scale extends from a four-year average to the adult level. In order to keep measuring units comparable each level of complexity has been measured separately, and similar physical and mental processes have been sought in the individuals compared. Four tests have been used; speed of tapping, speed and accuracy of aiming, pencil maze solution, and feature discrimination. In the location of absolute zeros it is assumed that the raw score zero must be above the absolute zero because the factors which contribute to success must have developed considerably before any success on a test is measurable. Two methods have been used to evaluate absolute zeros. One is the calculation of a point on the raw score scale where the dispersion of a normal group would be zero. This has no reference to either the shape of the curve or the time elements. The other method is the extrapolation of the known curve to a point representing nine months before birth. Both of these methods have been used in this study on a fairly uniform sample of three thousand white persons in Michigan from forty to twenty-four years of age. They give remarkable similar results. In plotting growth curves the twenty-year average has been taken as an arbitrary point 100 units from zero of development, and the percentages of the twenty-year averages have been computed for single year groups from 4 to 20 years. On all four tests the growth curves are practically the same when the absolute zeros are considered. In this case the mean square deviations are in all cases approximately 15 per cent of the mean. An hypothesis is put forward that these performances are principally dependent on the development of the central nervous system. These results are com-

pared with curves for height, weight, ossification, and various other physiological phenomena, and other performance and verbal tests. Typical differences between the curves are noted.

Ocular and Manual Dominance in Dyslexia. WALTER F. DEARBORN, Harvard University.

An analysis of the lateral dominance of approximately 100 cases of extreme difficulty in learning to read is presented. The severity of the difficulty in between a tenth and a fifth of the cases is of the grade commonly described as congenital alexia or word blindness. A stereoscopic method of determining ocular dominance devised by Selzer and an adaptation of a similar method of Maddux made by T. H. Eames, will be described and their advantages over the unilateral sighting methods demonstrated. The findings as to both ocular and manual dominance will be compared with those in the case of an unselected public school population as determined by F. D. Comfort. The preponderance in the clinical cases of (1) left-eyedness, of (2) the lack of ocular and manual dominance, and (3) of mixed conditions of ocular and manual dominance, *e.g.*, left-eyedness associated with right handedness or ambidexterity warrant an account in these objective terms of the etiology of deplexia and "congenital" alexia. Such an account is believed to be sounder and more serviceable than accounts which are based on theories of either cerebral localization or of cerebral dominance. Reading (in our language) requires a dextral sequence of eye movements. The primary reason why the above-described conditions are associated and, as the author believes, may in some cases be the cause of special difficulties in learning to read and write is that they produce uncertainty about the correct ordering or sequence of letters in word forms, and result in the storing up in the mind of faulty and mutilated images of words. These distorted images which do not agree with the phonetic sequence of words, make the prompt recognition of words, as is required in reading, difficult and at times impossible. The dextral sequence of eye movements is kinesthetically the essence of reading. Left-eyed children may tend to move in the opposite direction, to begin at the wrong end of words or to reverse the order or even to perceive letters in the wrong way as in seeing b as d, or boy as dog. Similar tendencies in the manual preferences for movements in the left hand may cause mirror writing. The wrong sequence of hand movement is, however, more easily recognized and ordinarily more readily corrected than that of the eye-movements.

Anticipation as a Source of Error in Serial and Maze Learning. FREDERICK HILLIS LUMLEY, Ohio State University.

In learning a maze or a series of numbers or letters subjects show a tendency to anticipate responses which would be correct later in the sequence. For example in learning a series of letters, *a j m l*, etc., the subject often selects *m* or *l* as the correct response when *j* is the right choice. In a maze the same tendency is shown by the number of errors made in culs-de-sac having the same direction as the true path one or more turns ahead. (a) There is an inverse curvilinear relation between the degree of anticipation (number of units skipped) and the frequency of the anticipatory errors. (b) The ratio of the far anticipations (several units skipped) divided by the near anticipations (one or two units skipped) decreases as the subject learns the series or maze. This points to the conclusion that serial learning is of the approximation and correction type discussed recently by Dodge. Each of the following experiments support the above statements: (1) Forty subjects learned three series of 20, 20, and 40 letters on a typewriter maze. (2) Sixty subjects learned a foot maze. (3) Twenty-five subjects learned a series of 15 two-place numbers. (4) Thirty-eight subjects learned a paper maze. In addition computation from the published results for maze learning in rats by Husband, Hubbert, Tolman, and Peterson; in ants by Schneirla; and in humans by Husband, Krakoff (unpublished), Perkins, and Warden gives the same curvilinear relationship mentioned in (a). The type of curve is strikingly similar to that which Ebbinghaus obtained for remote association in relearning experiments. It is suggested that the anticipatory errors made during learning may account for remote association as evinced in relearning.

Certain Emotional Conditions in Learning and Efficiency. FRED MCKINNEY, University of Chicago.

Frequently in learning experiments we find subjects who seem to be quite disturbed emotionally either over the fact that they are being timed and feel that they must work more quickly or else that their self-recognized lack of ability in intellectual tasks is being displayed. In this experiment it is intended to produce in all subjects this condition which occurs in a few of them in laboratory experiments where ability is being measured. In so doing (1) the effect of such a variable in the learning and efficiency situation can be measured; (2) also, we have, possibly, a means of measuring emotion through a channel which we formerly used only in cognitive processes;

(3) further, the data might serve as a means to an experimental check on the assumption that we can measure intelligence with minimum error by the time limit method. Precisely, the *object* of this experiment is to ascertain the effect of an unreasonable time limit and a suggestion of intellectual inferiority on learning and efficiency. The subject is given a time limit in which it is impossible to complete the task assigned to him. An automatic clock rings at the end of each minute and an interval timer sounds at the termination of the period given to do the task. The tasks are a stylus maze, a list of nonsense syllables, twenty-five multiplication problems and a ruler type steadiness tester. One hundred and thirty subjects were used, each serving four periods. The experimental conditions affect all tasks except multiplication, in which case the limit is six minutes and the time taken to complete the task is on the average twenty minutes. This seems to show that if the limit is absurd, it has no effect. Recall is affected in the case of nonsense syllables even with the absence of a time limit and a clock while the subject is recalling. Steadiness is affected most which seems to indicate that the subjects are emotionally disturbed. There is a tendency for the effect to become less toward the end of the four-day period. Many subjects showed marked emotional disturbances during the performance of the tasks under the experimental conditions. Many wanted to quit the experiment, many swore, stamped on the floor and showed weakening of the voice. Most of them reported feelings of inferiority.

PROGRAM B

SATURDAY, SEPTEMBER 12, 9:30 A.M.
WEST HALL, SECOND FLOOR
HOWARD C. WARREN, *Chairman*

A Unique Case of Color- and Form-Weakness. WM. D. TURNER, Kansas State College (in collaboration with DONALD MCL. PURDY and HARRY R. DESILVA, University of Kansas).

A student complaining of color difficulties, shows complete color-blindness with the Ishihara Test, and matches Holmgren wools with no respect for hue. He squints his eyes, wrinkles his forehead, prefers to read by daylight, looks out of the corner of his eye, fatigues and grows sleepy with continued reading, and is occasionally subject to sick headaches. Optical examination with homatropin shows about two-thirds normal visual acuity. The fundus and the intra-

ocular pressure are normal. There is very slight exophoria, and no nystagmus. There are positive and negative after-images, eidetic and memory images. The Nagel adaptometer indicates an unusually high threshold for light throughout extended adaptation periods. The luminosity curve for scotopic vision is normal. The visual field is greatly contracted. There is no clear evidence for central scotoma. Flicker is absent under conditions normally yielding gross flicker. "Black" and "white" surface colors are recognized, but grays are not sensed as intermediates. For film colors there are degrees of brilliance, but no "black" or "white." One finds normal constancy of brilliance, much reduced brightness discrimination, and brightness and color contrast. The photopic luminosity curve roughly determined by flicker is approximately normal. However, the subject can match only one hue (yellow) with a gray. Colors toward the spectral limits are consistently called "striking." Of a series of separated paper disks, first black, then white, then blue, then the other hues, and finally grays are both recognized and preferred. Blue is chosen from the group to match any hue; if blue is absent any other hue is chosen. The subject names only black and white correctly and with assurance. Binocular perception yields good depth; black and white fields fuse without rivalry to give "something that is neither." The reverse of ordinary irradiation effects appears. Figure weakness (amounting to contour change and size reduction, followed by contour blurring and color change), is favored by smallness of figure, similarity of brightness of figure and ground, low illumination, central vision, equal remoteness of figure and ground, perception as ground, lack of meaning, kind of form, steady and continued fixation, and attitude of subject. A related union of adjacent figures is favored by proximity of figures, attitude of the subject, likeness of figure size, alignment of contour, equal remoteness of figures, and participation in a whole. Seashore Tests of Musical Ability indicated very poor pitch and time discrimination, and worse tonal memory. The present study is hopefully regarded as preliminary to a more thorough investigation.

The Bearing of the Change in Slope of Critical Frequency-Illumination Curves for Spectral Lights on the Duplicity Theory and the Ferry-Porter Law. H. R. DeSilva and D. McL. Purdy, University of Kansas.

By the use of approved photometric methods involving a constant deviation spectrometer, episcotister disc and artificial pupil, critical

frequency values at various intensities were obtained for the following wave lengths: 650 mμ, 610 mμ, 580 mμ, 510 mμ, 480 mμ. The size of the colored field subtended a visual angle of only one degree. A small black fixation point in the middle of the stimulus field and four dimly lighted anchorage points just within the limits of the field of view served to enable the observer to keep his fixation constant. Previous investigators working with much larger fields have found a sudden change in slope of the linear graph of fusion frequencies with the logarithms of the illuminations and have accounted for this change in terms of the functioning of scotopic and photopic mechanisms. This accepted interpretation represents one of the strongest arguments for the duplicity theory and irons out a difficulty in the acceptableness of the Ferry-Porter law by accounting for the break in linearity of function. Instead of obtaining the straight line which would be expected if only the photopic mechanism functioned we found a change in slope of the critical frequency-illumination curves. These results show the need of some new interpretative principle to account for the change in slope in such curves. The conventional one in terms of the duplicity theory is obviously inadequate. As some of our curves tend to be ogival rather than linear in form there are indications that the Ferry-Porter law does not hold for foveal vision.

A Quantitative Study of the Initial Phase of the Visual After-Image. THEODORE F. KARWOSKI, Dartmouth College.

This research was conducted by means of the "dimming effect" technique. Spectral lights were dimmed a known fractional amount of the original brightness. Upon the sudden reduction of the intensity of the stimulus an after-image or dimming effect was immediately experienced. The initial phase of this experience was matched with quantities of spectral light upon an adjacent field. The equations thus derived constitute the quantitative part of the research. The initial after-image response was observed under conditions which, more or less, isolated the three variables in the visual sensation, namely, hue, brightness and saturation. All stimuli subtended a retinal angle of three degrees. The results show that the initial after-image phase tends to be bluish, violet or purplish when the lights are relatively bright, and also, when they are relatively unsaturated. The literature concerning violet and purplish after-images is considered and an explanation for the frequent appearance of the violet or purplish hue is offered in terms of a differential response of the color receptors to changed conditions of the stimulus.

Duration of Stimulation and the Flight of After-Images from Sodium Yellow in the Arc Spectrum. ADELBERT FORD, Lehigh University.

The shift of after-images, seen in total darkness, from positive to negative and separated by a period of lack of all visual sensation, has been noted by Ebbecke on a carefully measured basis. Yellow seems to violate this principle, under some conditions, and is a color which has often occupied disputed positions in color theory. A Bausch and Lomb arc spectrum projector, with a 20-ampere, D.C. arc, was arranged to throw the spectral band on a screen. A section in the region of sodium yellow, 1/50 the width of the total spectrum, was converged by means of a chromatically corrected lens, to pass a pencil of beams through the pupil, the pencil being smaller than the minimum size of the pupil at maximum contraction. A spot approximately the size of the fovea was fixated by dark adapted subjects for various lengths of time, from 1/50 sec. to 10 sec. For very short durations of time the immediate after-effect of yellow stimulation is a positive after-image followed by a total loss of all visual sensation, and this by the appearance of dark blue which lasts for several minutes and then disappears. A stimulation 1/5 second in duration gave the following order of colors: yellow, orange, violet, purple, blue, with no zero point other than the usual fluctuation phenomena running throughout the series. Durations greater than one second gave flights of variable hues somewhat similar to the after-images from an intensely white light. During the flights of after-images from a stimulation of 1/50 second a positive after-image projected on a gray field becomes negative in character, and the negative after-image, projected on a gray field, remains negative. All after-images from long stimulation turn to their complements upon projection on white or gray backgrounds with sufficiently strong white light illumination. The appearance, with gradually increasing durations of stimulation, of colors other than the positive after-image or its complement, may contribute important facts for color theory.

New Experiments upon Photopic Adaptation and the Classic Laws of Adaptation. HARRY HELSON, Bryn Mawr College.

The classic laws of adaptation were based upon experiments involving stationary fixation in order to maintain constant stimulation of the retina, or, in the case of moving fixation, weakly selective glasses or filters. These conditions resulted in the formulation of the following generalizations: (1) color stimuli after acting on the retina

for a long time fail to produce color sensations; (2) if colored glasses are worn continually sooner or later all objects appear in their natural colors; (3) adaptation results in neutral gray. By using a colored sphere with *Os'* eyes at the center, *constant stimulation of the retina was secured, but eye-movements allowed.* In spite of fulfilling the conditions demanded by the classic theories, little or no adaptation occurred. A second set of experiments consisted in using rigidly selective filters as glasses, that is, filters which transmitted only a narrow portion of the spectrum. After wearing these glasses for as long as five hours, no appreciable adaptation took place and the color of the glasses still affected all objects seen through them. In none of our experiments was a neutral gray reached. In any case, laws (1) and (2) contradict each other, since it is impossible to adapt to one or more colors (which should give gray instead of the colors in question) and at the same time see all objects naturally. The so-called laws of adaptation as usually stated without reference to the selective properties of the glasses used, intensity of stimulation, the rôle of eye-movements, and a host of other factors either mean nothing or are untrue. Troland showed that the third law does not hold for intense stimulation even for stationary fixation. These experiments furnish added evidence of their restricted application since the conditions demanded by the classic theories have been met. They also demonstrate the untenability of that most popular of all theories of vision among psychologists, the Hering theory. (This work has been done with the coöperation of Dr. D. B. Judd of the Bureau of Standards who will appear as co-author in the published account.)

PROGRAM C

SATURDAY, SEPTEMBER 12, 9:00 A.M.
ROOM 8, GROUND FLOOR
HERBERT WOODROW, *Chairman*

A Preliminary Report on a Study of Fetal Conditioning. WILBERT S. RAY, New Jersey State Hospital at Trenton. (Introduced by James Quinter Holsopple.)

A Comparison of Transfer in Human and Animal Subjects. HAROLD GULLIKSEN, University of Chicago. (Introduced by Harvey A. Carr.)

The Rat's Speed-of-Locomotion Gradient in the Approach to Food. CLARK L. HULL, Yale University.

The Effects of Physical Barriers and Electric Shocks on the Hunger and Sex Responses of Rats. KNIGHT DUNLAP, EVELYN GENTRY and THORNTON W. ZEIGLER, Johns Hopkins University.

An Automatic Recording Device for Use in Animal Experimentation. W. T. HERON, University of Minnesota.

Sex Behavior of the Rat After Removal of the Uterus and Vagina. JOSEPHINE BALL, Johns Hopkins Hospital.

An Analysis of the Effect of Doors in the Maze. J. F. DASHIELL, University of North Carolina.

The Effect of Continuous Rotation on the Albino Rat. ROY M. DORCUS, Johns Hopkins University.

PROGRAM C

SATURDAY, SEPTEMBER 12, 2:00 P.M.

EAST HALL, SECOND FLOOR

JOHN F. DASHIELL, *Chairman*

The Problem of Selective Migration Among Negroes. OTTO KLINEBERG, Columbia University.

A Method for Measuring Institutional Behavior. FLOYD H. ALLPORT (in coöperation with MILTON DICKENS and RICHARD L. SCHANCK), Syracuse University.

The Relation Between Liberal and Conservative Attitudes in College Students and Other Factors. A. J. HARRIS, Purdue University.

The Psychology of Conservatism and Radicalism. C. H. BEAN, Louisiana State University.

The Form of the Curve of Memorizing. GOODRICH C. WHITE, Emory University.

A Comparative Study of Conscientiousness in Two Adolescent Groups. M. F. MARTIN, West Springfield, Mass.

Color Preference: A Study of Race, Age, Hue, Chroma, and Value Factors. W. R. ATKINSON, Southwestern College.

Parental Attitudes. RALPH M. STOGDILL, Ohio State University. (Introduced by Herbert A. Toops.)

PROGRAM C

SATURDAY, SEPTEMBER 12, 2:00 P.M.
WEST HALL, SECOND FLOOR
LEONARD CARMICHAEL, *Chairman*

Psychological Vocabulary and Concepts in Terms of Professional Value. MILTON B. JENSEN, Central State Teachers College, Michigan.

An Empirical Study of Integrated Response Mechanisms. ALVHH R. LAUER, Iowa State College.

Students' Reactions to Abnormal Psychology. W. S. TAYLOR, Smith College.

Egocentric and Prelogical Modes of Thinking and Understanding Among Civilized Adults. THEODORA M. ABEL, Sarah Lawrence College.

An Attempt to Increase the Predictability of College Ability Tests by Work-Limit Methods. JAMES P. PORTER and BELFORD B. NELSON, Ohio University.

Comparative Methodology in the Study of Delinquent Behavior. LOWELL S. SELLING, Institute for Juvenile Research, Chicago.

Some Problems Involved in the Use of the Kuhlmann-Anderson as an Individual Test. MARCEL KOVARSKY, Jewish Board of Guardians, New York City.

Statistical Results of Intelligence Tests in College. HERBERT W. ROGERS, Lafayette College.

PROGRAM C

SATURDAY, SEPTEMBER 12, 2:00 P.M.
ROOM 8, GROUND FLOOR
R. M. ELLIOTT, *Chairman*

The Reliability of a Self Rating Scale. W. E. SLAGHT, Cornell College.

The Applied Psychology of Selling Insurance. CORA LOUISA FRIEDLINE, Randolph-Macon Woman's College.

The Prediction of Vocational Aptitude and of Success and Failure from Photographs. MORRIS S. VITELES, University of Pennsylvania.

Coördination of the Research of Schools, Industry, and Government. L. J. O'ROURKE, U. S. Civil Service Commission.

The Efficiency-Expert's Idea of Personal Efficiency. H. M. JOHNSON, Mellon Institute.

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